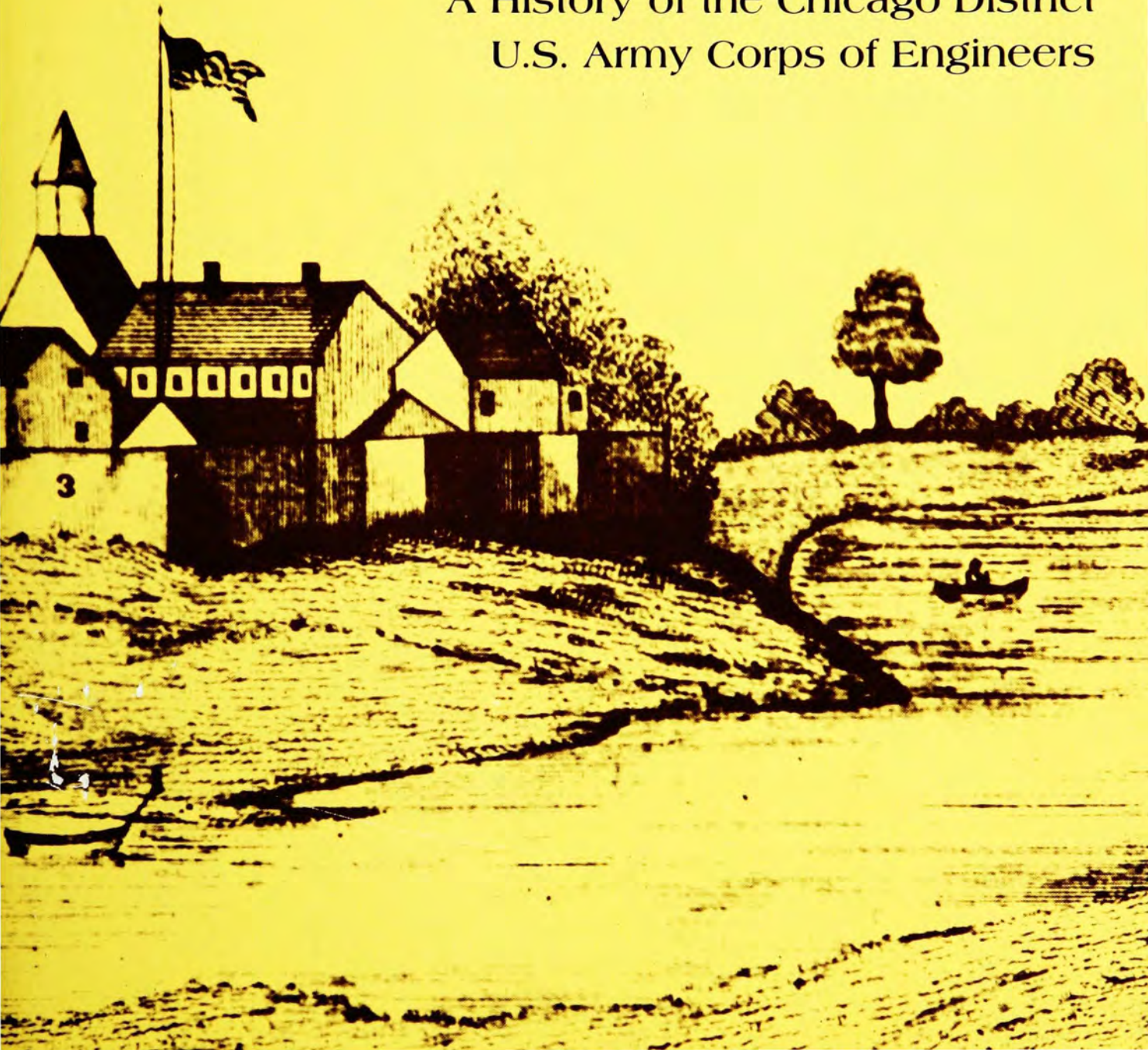




Those Army Engineers

A History of the Chicago District
U.S. Army Corps of Engineers



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Chicago District Engineers



Maj. G. L. Gillespie
July 1874–May 1877



Brig. Gen. William H. Bixby
April 1905–Sept. 1908
as LTC.
Dec. 1918–April 1919
as Brig. Gen.



Maj. Thomas H. Rees
Oct. 1908–Aug. 1910



Maj. Charles S. Bromwell
Aug. 1910–Oct. 1910



LTC. George A. Zinn
Oct. 1910–Aug. 1913



Maj. Herbert J. Wild
June 1928–Aug. 1928



Col. William C. Weeks
Aug. 1928–Jan. 1932



Col. W. G. Caples
1931 to 1933



Col. Daniel I. Sultan
Jan. 1932–June 1934



Col. Wendel P. Trower
April 1946–Oct. 1949



Col. Jack P. Campbell
Oct. 1949–April 1952



Col. Robert P. Kline
April 1952–Dec. 1953



Col. Edward E. Bennett
July 1966–March 1969



Col. William G. Stewart
March 1969–July 1971



Capt. G. J. Lydecker
May 1877–May 1882



Maj. W. H. Benyard
June 1882–Dec. 1884
July 1885–Nov. 1886



Capt. W. L. Marshall
April 1888–Dec. 1899



Maj. J. H. Willard
Jan. 1900–Oct. 1901



LTC. Oswald H. Ernst
Nov. 1901–March 1905



Maj. Harley B. Ferguson
Aug. 1913–March 1914



Col. C. S. Riche
Aug. 1916–Aug. 1918



Col. W. V. Judson
April 1914–July 1916
April 1919–March 1921
July 1921–April 1922



Maj. Rufus W. Putnam
April 1922–June 1926



Col. Edward H. Schulz
July 1926–June 1928



LTC. Donald H. Connolly
July 1934–June 1938



Capt. Samuel N. Karrick
July 1938–June 1940



LTC. Richard U. Nicholas
June 1940–Nov. 1940



Brig. Gen. Charles Keller
Nov. 1940–Sept. 1943



Col. H. J. Woodbury
Oct. 1943–April 1946



Col. Philip F. Kromer, Jr.
Dec. 1953–May 1956



Col. J. B. W. Corey, Jr.
July 1956–Aug. 1959



Col. Charles F. Mitchim
Aug. 1959–July 1960



Col. J. A. Smedile
July 1960–March 1963



Col. John C. Martina
June 1963–July 1966



Col. Richard M. Wells
August 1971–August 1973



Col. James M. Miller
August 1973–April 1976



Col. Andrew C. Remson, Jr.
April 1976–Feb. 1978
July 1978–July 1978



LTC. Howard N. Nicholas
Feb. 1978–July 1978
Jan. 1980–present



Col. James R. C. Miller
July 1978–Jan. 1980

Those Army Engineers

A History of the Chicago District
U.S. Army Corps of Engineers

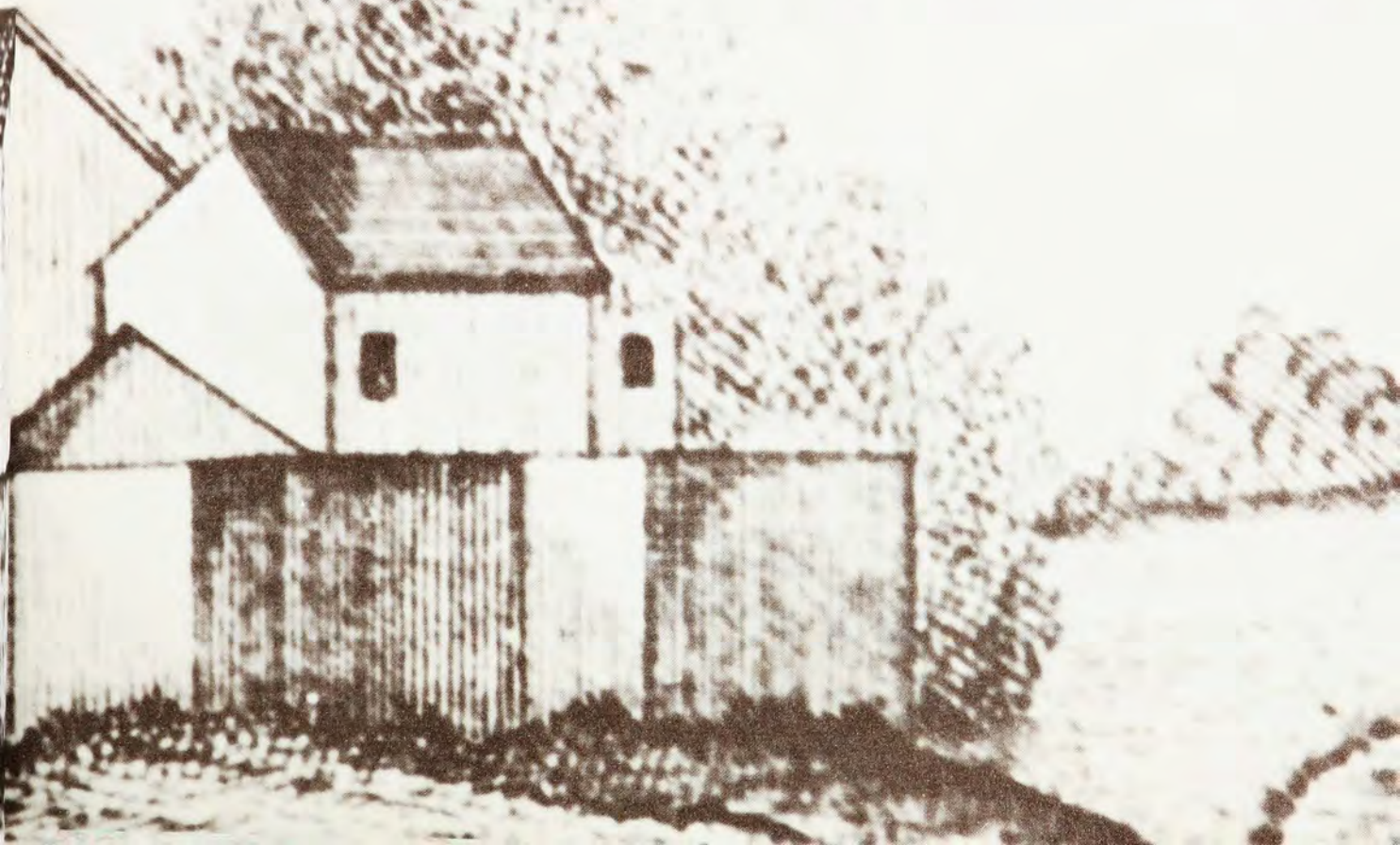


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Those Army Engineers

A History of the Chicago District
U.S. Army Corps of Engineers

by John W. Larson



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Dedicated
to the men and women
of the Chicago District

Beginning in 1816, when Major Stephen H. Long visited the Illinois Territory to carry out the first scientific survey of the Chicago Portage, United States Army engineers have played an important role in the development of the water resources of the region. The Army's role grew during the years that followed. The Chicago District of the U.S. Army Corps of Engineers was established in 1870 after the authorization of Chicago Harbor improvements and initiation of Great Lakes navigation system development. The district soon became a focus for the development of navigation works to meet the needs of a growing nation.

The civil works program of the Army Corps of Engineers is carried out nationwide under the direction of Congress, and much of what is related here of the Chicago District is true as well for other areas of the country. But as the history reveals, the national program was surprisingly decentralized, democratic, and frequently involved a lively interaction with local interests. Just as the Corps civil works program differed from region to region, it changed here from decade to decade in ways generally paralleling developments in other areas of the nation's activity.

The size of the Chicago District reached a peak in 1955 when it included the western portions of Michigan, eastern Wisconsin, northwestern and central Illinois, and part of northwestern Indiana. In 1977 the district was relieved of responsibilities in Michigan. And in November 1979 the Chief of Engineers announced his decision to reduce the Chicago District area of responsibility to that encompassed by the eight-county area surrounding metropolitan Chicago. This decision provides an appropriate breakpoint to record the many accomplishments of the past, including the early Army work in the region before the Chicago District was formed.

The purpose of this undertaking is to recognize the many contributions to our nation made by district employees over the last

century and a half. We trust *Those Army Engineers* will prove to be a valuable asset to those interested in following the historic role of the U.S. Army Corps of Engineers in the development of the Great Lakes and the Illinois River basin.

A handwritten signature in black ink, reading "James R. C. Miller". The signature is written in a cursive style with a large, stylized initial "J".

JAMES R. C. MILLER
Colonel, Corps of Engineers
District Engineer
December 31, 1979

Acknowledgments

The author is responsible for whatever faults may appear in this history while that which is of value is largely due to the many people who assisted him. When the work began Dr. Jesse Remington was still in charge of the Corps' Historical Division at Baltimore, Maryland, and to him the author owes his original interest in Corps history as well as grateful appreciation for assistance in finding his way to source materials located in the National Archives. To Dr. Remington's successor, Dr. Albert Cowdry, and to Dr. Harold Kanerek, also of the Historical Division, OCE, he is indebted for valuable criticism of the initial draft.

As much of the research and writing was accomplished in Minnesota, the St. Paul District of the Corps, and particularly Delores Sudeith, Chief of Administrative Services, must be thanked for providing ready access to the District's library. The staff of the reference library of the Minnesota Historical Society provided selfless assistance in making Federal documents in the Society's collections available.

Chicago District personnel were indispensable for providing documents, comments and criticism. At the outset Mr. Henry J. Rebman was the prime contact at the District office. The author was not alone in feeling the loss of Mr. Rebman's genial helpfulness when he tragically passed away after a brief illness. More recently it has been Mr. Stephen H. Buch, Chief of Administration Services, who has provided an open door to the District's resources and has patiently waited for the completed manuscript.

The spontaneous assistance given by so many Chicago District personnel revealed such genuine interests in the District and its history that the author can only hope that the results meet with their expectations. To them and to all their associates in the District this volume is dedicated.

John W. Larson
Taylors Falls, Minnesota, 1978

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Part One

The half-forgotten
first half century

1816-1866





Chapter 1



Lake Michigan: remote frontier, 1816-1823

In the summer of 1816 Major Stephen H. Long, Topographical Engineer with the U.S. Army, on orders from Secretary of War William H. Crawford, reconnoitered little known areas of Illinois Territory. In the course of his expedition he followed a path beside the southern shore of Lake Michigan southwestwards from Michigan City, Indiana, along a range of high sand hills, then in a northwesterly direction to Fort Dearborn at Chicago. He found Fort Dearborn, which had been destroyed by the Indians in 1812, being rebuilt on a point of land formed by a bend in the Chicago River, about 800 yards from the river's mouth, by soldiers who had arrived under the command of Captain Hezekiah Bradley on 4 July 1816. "The works," wrote Major Long, "are in a state of forwardness that does much credit to their industry, and will probably be completed in the course of the next season."

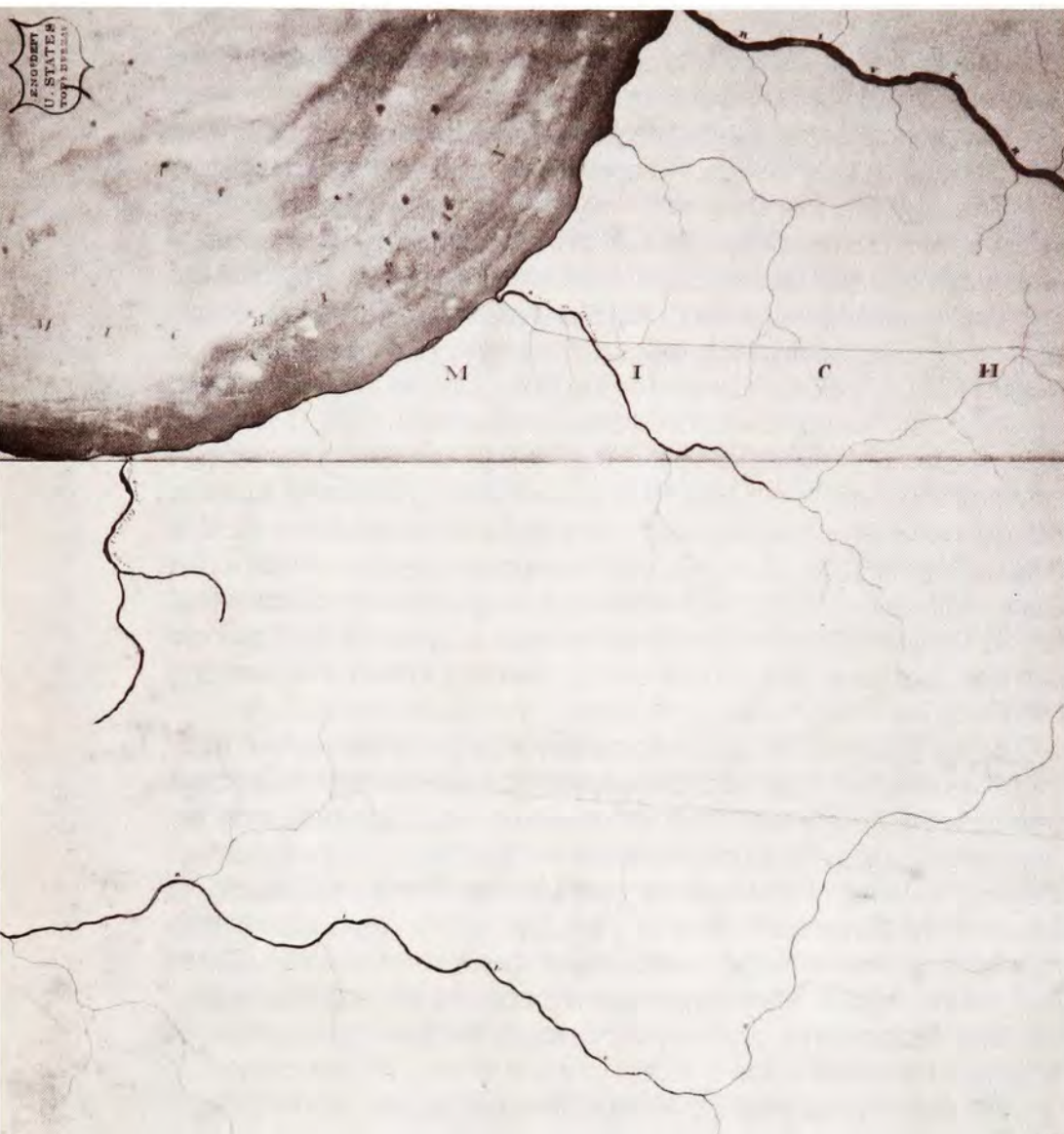
The topographical engineer noted that "The entrance into Lake Michigan . . . which is 80 yards wide, is obstructed by a sandbar about 70 yards broad." Where the bar was highest the water rarely exceeded 2 feet in depth. It would be no difficult task, he explained, to remove the bar. "Piers might be sunk on both sides of the entrance, and the sand removed between them." Since the river and each of its branches for 2 or 3 miles inland have "sufficient depth of water to admit vessels of almost any burden" removing the sandbar at the river's entrance would provide "a safe and commodious harbor for shipping, a convenience which is seldom to be met with on the shores of Lake Michigan."

Facing page:
Brevet Major Stephen
Harriman Long, Topo-
graphic Engineer who in
1816 made the first
survey of the Chicago
portage area. Major Long
was a Dartmouth College
graduate and a pro-
fessor of mathematics at
West Point from 1815-1818.

Lake Michigan:
remote frontier,
1816-1823



As a settlement Chicago was insignificant in 1816, but "The central position of the place—the facility the country affords for communicating both by land and water with almost every other part of the north and northwest frontier gives it a high claim to consideration as a military post. . . ." Fort Dearborn was in a position to control the use of an important water link between the Great Lakes and the Mississippi River, the Chicago portage. Major Long followed this old Indian and fur trader route in a southwesterly direction by way of the south fork of the Chicago River, along the north side of a small body of water



Map of Major Long's 1816 journey to Illinois Country.

called Mud Lake to the Des Plaines River which brought him to the Illinois River by which one could reach the Mississippi River.

From about 1673 to 1700, the French, explorers, missionaries, and fur traders had used the Chicago portage in passing from Lake Michigan to the Des Plaines River. Several descriptions of the Chicago portage have survived from the 17th century, among them that of Joliet, as recorded by Father Dablon in a letter from Quebec of 1 August 1674. "We could go with facility to Florida in a bark, and by very easy navigation. It would only be necessary to make a canal by

cutting through but half a league of prairie, to pass from the foot of the Lake of the Illinois (Lake Michigan) to the St. Louis (Illinois) River, which empties into the Mississippi."

It is probable that the route followed by Major Long in 1816 from the Chicago River to the Des Plaines River was the same as described and used by the French in the early period. For nearly a hundred years, from around 1700 to 1795, use of the Chicago portage by white men was generally prohibited by hostile Indians. Then, in 1795 at the treaty of Greenville which followed General Anthony Wayne's victory over confederated Indian tribes at the battle of Fallen Timbers in August 1794, the Indians ceded to the United States the tract of land on which Fort Dearborn was originally constructed in 1803. Thereafter, except for an interlude during the War of 1812, the Chicago portage became an important route for traders traveling by small boat or canoe between Lake Michigan and the Mississippi River. In 1814 President James Madison, convinced perhaps by his friend Nathaniel Pope, Territorial delegate from Illinois, of the value of such a waterway, asked Congress to authorize construction of a canal at the Chicago portage. Congress did not act at that time but, as we shall see, the idea was kept alive until a later date.

Major Long made a preliminary survey of this water route a matter of his particular attention, and expressed the opinion that "a canal uniting the waters of the Illinois with those of Lake Michigan, may be considered of the first importance of any in this quarter of the country." Thinking in terms of small boats he believed "The water course . . . between the River Des Plaines and the Chicago River needs but little more excavation to render it sufficiently capacious for all the purposes of a canal." Water could be provided for the canal, he believed, by building a dam of moderate height across the Des Plaines River. In addition, locks would be needed at each end of the canal.

Although Illinois would claim sufficient residents to apply for and obtain Statehood in 1818, most of the population was concentrated in the southern portion of the State. Elsewhere, for the most part, Illinois was still Indian country and not all friendly Indian country. Long enumerated the principal tribes in the area, "The Sacks, Foxes, Potawatomes, Kicapoos, Miamis, Delewares, Chepeways, Shawnees, and Kaskaskias," and warned that "the greater part of . . . (them) took up arms against the United States in the late war, and probably would do the same again upon a renewal of hostilities with Great Britain."

By 1818 Chicago was hardly more a community than it had been 2 years earlier but its potential at the head of a water route connecting

the Mississippi River and the Great Lakes was not lost to Illinois politicians. When in April 1818 a bill for an enabling act to provide Statehood for Illinois was being considered in the House of Representatives, Illinois Territorial Representative Nathaniel Pope successfully argued to have the State's northern boundary fixed at 42°30' latitude. The original proposal would have set the northern boundary at the same level as that of Indiana. Pope's initiative resulted in moving the boundary 45 miles to the north. His argument for this change anticipated the sectional conflicts which decades later resulted in civil war. The object of Pope's amendment, he said, "was to gain, for the proposed state, a coast on Lake Michigan. This would afford additional security to the perpetuity of the union, inasmuch as the State would thereby be connected with the States of Indiana, Ohio, Pennsylvania and New York through the Lakes. The facility of opening a canal between Lake Michigan and the Illinois River . . . is acknowledged by everyone who has visited the place. Giving to the proposed State the port of Chicago . . . will draw its attention to the opening of the communication between the Illinois and that place and the improvement of that harbor."

When Illinois became a State in 1818 what was left of the Northwest Territory, that is what today makes up the States of Michigan, Wisconsin and that part of Minnesota east of the Mississippi River, became Michigan Territory. Michigan's first Territorial Governor was Lewis Cass. In 1819 he proposed to Secretary of War John C. Calhoun an expedition from Detroit to the western borders of the Territory "to carry the flag of the United States into those remote regions, where it has never been borne by any person in a public station." In addition, "a tour through that country, with a view to examine the production of its animal, vegetable, and mineral kingdoms, to explore its facilities for water communication, to delineate its natural objects, and to ascertain its present and future probable value, would not be uninteresting in itself, nor useless to the government."

Calhoun endorsed the project. He recommended a U.S. Army Corps of Engineers officer, Captain David Bates Douglass, to go along as topographer, charged with taking astronomical positions and constructing a map of the area traveled. In addition, in his instructions to Douglass, Calhoun directed that "The departments of zoology and botany will require as much of your attention as you may be able to bestow upon them."

Douglass, an 1813 Yale graduate, had distinguished himself as an engineer officer on the Niagara frontier during the war and had then remained in the Engineer Corps employed chiefly as a teacher

of natural philosophy at West Point. Among his additional duties he had most recently participated in a survey of the international boundary from Niagara to Detroit.

Calhoun's second appointment to the expedition was Henry Rowe Schoolcraft, who was to act as mineralogist and geologist. Schoolcraft, who was 27, had spent his youth learning the glass industry but at 25 he had gone west, visited the lead mining country in Missouri and published a plausible account of his experience which attracted Calhoun's attention.

In January 1820 Governor Cass was busily selecting the other participants in the expedition. He also ordered three large canoes from Indians in Saginaw country. The departure was set for as early in May as conditions might permit, and to allow time for travel to Detroit of those who must come from more distant points. Captain Douglass left West Point late in the evening of 28 April 1820. He traveled comfortably to Albany by steamboat, arriving there the next afternoon. There was no through stage from Albany to Buffalo, but Douglass made arrangements as he went, changing stages six times.

For several decades before 1800 this route across New York to Lake Erie had been blocked by the Iroquois Indians. They had been allies of Colonial British against the French and they remained loyal to the British during and after the Revolutionary War and so blocked the route to Lake Erie to westward moving immigrants from the Northeastern Seaboard. The immigrants avoided the route now being taken by Douglass from Albany to Buffalo and preferred a route west across Pennsylvania, the Lancaster Pike. From Pittsburgh, they could easily proceed down the Ohio River by flat or keel boat and after 1811 by steamboat. It was due to this route that Ohio had enough settlers to become a State in 1803, Indiana in 1816 and Illinois in 1818. The rest of the Northwest Territory remained sparsely settled. By 1820 the Mohawk Valley was domesticated and celebrated for the fertility of its soil. The Erie Canal which was being built would, after 1825, provide an inexpensive water route from Albany on the Hudson River to Buffalo on Lake Erie for the millions of immigrants who flocked into the country bordering the northern and western lakes in the decades prior to the Civil War. Once these settlers were producing a surplus on their farms, the same route would carry their products with relative speed and little expense to New York and the markets of Europe.

When Douglass arrived at Buffalo on 1 May he discovered that the departure of the steamboat "Walk-in-the-Water" from Black Rock on the Niagara River near Buffalo would be delayed because of ice on Lake Erie. "Walk-in-the-Water," which was the first steamboat on

the Great Lakes west of Niagara, was a 338-ton, 135-foot schooner-rigged paddle-wheeler, actually a sailing craft with auxiliary power from wood-burning boilers. Since her maiden voyage in August 1818, "Walk-in-the-Water" routinely carried general cargo and passengers on runs to Detroit, and had steamed north and west of Detroit in the summer of 1819 to receive an astonished and enthusiastic welcome at Mackinac Island at the head of Lake Huron before venturing a short distance into Lake Michigan. Moving personnel and supplies to the United States Army and traffic related to the fur trade provided the revenue to justify occasional steamboat trips this far north and west.

On 6 May 1820 the passengers, including Douglass and Schoolcraft, were permitted to embark and "Walk-in-the-Water" was pulled up 2 miles of rapids of the Niagara River by means of ropes hitched to 10 yoke of oxen walking along the riverbank. At Buffalo the harbor was not deep enough for "Walk-in-the-Water" to enter but she was anchored outside for a short time before steaming off at 11 a.m. Shortly before midnight on 8 May "Walk-in-the-Water" docked at Detroit. Governor Cass and Major General Alexander Macomb, Commander of the Fifth Military Department with headquarters at Detroit, were among those who waited at the wharf to welcome Douglass and Schoolcraft. The next day Douglass dined with the Governor, learned in greater detail his plans for the expedition and found that the canoes had not yet arrived and that it would be some days before the expedition would push off.

Meanwhile, other participants in the expedition were gathered in Detroit. Among them, in addition to Cass, Douglass and Schoolcraft, were two 20-year-olds, James D. Doty, official journalist for the expedition, who later became Territorial Governor of Wisconsin, and Charles C. Trowbridge of Detroit, who acted as Assistant Topographer to Captain Douglass. Dr. Alexander Wolcott, Jr., a physician and the U.S. Indian Agent at Fort Dearborn, was the expedition's medical officer. In addition, there were more or less equal numbers of soldiers mostly of French descent and chosen by Cass for their capacity to endure fatigue, Indian braves of the Ottawa and Chippewa nations and French voyageurs well acquainted with traveling by canoe. There were also 2 interpreters and at times guides joined the party along the way. In all, the party included some 40 persons.

Three large birchbark canoes, each 30 feet long, 6 feet wide across the center, and capable of carrying about 2 tons each in addition to a dozen or more men with personal gear, would be used at the outset of the expedition. At other times larger or smaller canoes were used as circumstances made one or the other more desirable.

The bulk of the party boarded the canoes at Detroit at 4:00 on the afternoon of 24 May. From the beginning strong headwinds delayed their progress. On 26 May the expedition's three canoes were being paddled close to the American shore of Lake St. Clair which, along with the Detroit and St. Clair Rivers, provides the connecting link between Lake Erie and Lake Huron. In the afternoon they again experienced strong and adverse winds. Waves broke over the bows of the plunging canoes. One man in each was kept busy bailing water. Toward evening they approached the mouth of the St. Clair River. At many places far from the shore of the lake, rushes grew and the canoe paddles touched bottom. Douglass concluded that like the Nile and the Mississippi Rivers the St. Clair had transported quantities of waterborne particles to its mouth and created a delta which encroached upon the lake and made navigation difficult. The St. Clair Flats, as the delta was called, were to become a significant obstruction to navigation between such lake ports as Chicago, Illinois, and Buffalo, New York, before they were deepened by dredging in the decade prior to the Civil War.

Not until the afternoon of 6 June, after they had rounded the western end of Bois Blanc Island did the party catch sight of Mackinac Island. Schoolcraft was inspired to write that the island "rises from the watery horizon in lofty bluffs imprinting a rugged outline along the sky, and capped with two fortresses on which the American standard is seen conspicuously displayed. A compact town stretches along the narrow plain below the hills, and a beautiful harbour chequered with American vessels at anchor, and Indian canoes rapidly shooting across the water in every direction." Schoolcraft called Mackinac Island our "Northwest metropolia" and indeed as the site of the chief and only town in a vast wilderness area Mackinac Island, originally Michilimackinac, was the scene that summer of 1820 of remarkable activity.

Much of the activity observed on the island was due to the trappers and fur traders who brought in their winter-long accumulation of pelts and who now spent money freely as a release from months of privation in the wilderness and to stock up for another season in the woods. In addition, Mackinac Island was a way station for men and supplies destined for frontier military fortifications at Green Bay and Chicago, on Lake Michigan, and still farther away at Prairie du Chien and St. Anthony Falls on the Mississippi River. A company of the U.S. Infantry which occupied the fort accounted for additional coming and going in the busy little lake port.

With fair and favorable wind on the morning of 12 June, the

expedition, now in four canoes, paddled northeastward toward De Tour at the mouth of the St. Marys River. Their journey would take them to Sault Ste. Marie where Governor Cass obtained the cession of a 4-mile square tract of land from the Indians for eventual use for a fort. They would paddle along the southern shore of Lake Superior and then push inland by way of a river and portage route to the Mississippi River. Then, after a futile attempt to locate the source of that river, they would paddle downstream to Fort Crawford at Prairie du Chien near the mouth of the Wisconsin River.

At Fort Crawford they found a company of Infantry, about 90 men, and a settlement of French-Indian inhabitants of about 500. On the morning of 9 August the party left Prairie du Chien, paddled 3 miles down the Mississippi River, and then turned eastward into the mouth of the Wisconsin River. For 5 days they traveled up this swift and shallow stream until some 180 miles from Prairie du Chien they reached the 1½-mile portage which would take them to the Fox River. The Fox-Wisconsin portage had been well known and had been used by French fur traders to pass between Lake Michigan and the Mississippi River from possibly as early as 1659 when the adventurers Medart Chouart Groseilliers and his brother-in-law Pierre-Esprit Radisson are thought to have discovered the route.

This was their easiest portage. An enterprising Frenchman, the only white man in the area, had constructed a wagon road and by means of wagon and oxen pulled their luggage over the portage for \$2 a load. After another 6 days and 190 miles down the Fox River, on 20 August, they sighted the settlement of Green Bay. The view from the distance of farmhouses, fences, and cultivated fields, of Fort Howard, and far away the sight of vessels in the harbor stimulated Schoolcraft to "recall at once to the imagination the most pleasing recollections of civilized life." They were welcomed at the fort with peals of artillery and military music. Fort Howard, a four-sided picketed enclosure with 4 towers, housed a garrison of 600 to 700 men. The settlement of French-Indian inhabitants included about 60 households and was scattered for 3 or 4 miles along the river.

The schooner "Decatur" bound for Detroit waited in the Green Bay harbor. Douglass and Schoolcraft packed their geological and botanical specimens and put them on board. The soldiers of the expedition, originally from Detroit and Fort Gratiot, were released here to join their units which had, in the meantime, moved to Fort Howard. Most of the Indians were also discharged, provided with a canoe and provisions, and sent home. Doty and Trowbridge were to proceed with the remaining Indians to Mackinac Island and to make



When U.S. Army Engineer Captain David Bates Douglass arrived at Chicago in a birchbark canoe on the evening of 26 August 1820 he saw three deer sporting on the bank. The village had less than a dozen houses; the garrison, Fort Dearborn, about 160 men.

observations of the shore on the way. The remainder of the party, with the voyageurs, set out southward along the west coast of Lake Michigan for Chicago, a journey of 6 or 7 days. Under way they camped overnight at the mouth of the Milwaukee River where there was a trading post, two American families and an Indian village.

As Douglass' canoe approached Chicago on the evening of 26 August he saw three deer sporting on the bank. The village had less than a dozen houses, the garrison, Fort Dearborn, about 160 men. The Governor's canoe arrived the next morning. Together they rode out 7 miles to a fork of the Chicago River, the one from which by portage one could reach the Des Plaines River, a tributary of the Illinois River, and from there the Mississippi River. They discussed the feasibility of a canal to connect the Chicago and Des Plaines Rivers.

A sandbar, Douglass noted, at the mouth of the Chicago River prevented Lake Michigan vessels from entering the harbor there. Nevertheless, Schoolcraft, who found the country around Chicago fertile and beautiful, foresaw that Chicago would become more than an agricultural market town; it would be "a depot for inland commerce ... a thoroughfare for strangers, merchants and travelers." In 1820 his prediction seemed visionary.

At Chicago, Governor Cass decided to return to Detroit on horseback along an old Indian trail across the southern peninsula of Michigan. Douglass and Schoolcraft, with the remaining voyageurs, would complete the survey of the eastern shore of Lake Michigan and join Doty and Trowbridge at Mackinac Island.

Schoolcraft and Douglass spent 9 days paddling up Michigan's western shore. Journal entries of both men show they were beginning to weary of the long journey. On the evening of 7 September they "had at last the happiness to descry the island of Mackinac." The next day, though there was a stiff headwind, they selected their best paddlers and crossed to the island, leaving their luggage to come along in the second canoe when the wind abated. At Mackinac Island Schoolcraft and Douglass joined the young men who had proceeded there from Green Bay. Together on 13 September they left Mackinac Island for Detroit and arrived there 10 days later, 4 months after their departure, and after a voyage of over 4,000 miles in birchbark canoes.

In 1823 Major Long accompanied by William H. Keating from the University of Pennsylvania, on an expedition to what is now the north-western corner of the State of Minnesota, stopped at Chicago from 5 to 11 June. Keating, who wrote a narrative of the expedition from his own logs and notes of others made during the expedition, offers a less flattering description of Chicago and the portage area than those presented by Douglass and Schoolcraft.

We do not know to what extent Major Long was of the same mind as Keating as to the possible future of Chicago but Keating believed it offered little inducement for a settler. "The whole annual amount of trade on the lake did not exceed the cargo of five or six schooners. . . ." And even though Chicago might become one of the points of direct communication between the northern lakes and the Mississippi River, that trade, Keating believed, would be limited, "the dangers attending the navigation of the lake, and the scarcity of harbors along the shore, must ever prove a serious obstacle to the increase of the commercial importance of Chicago." Furthermore, "The extent of the sand banks, which are formed on the eastern and southern shore, by the prevailing north and northwesterly winds, will likewise prevent any important works from being undertaken to improve the port of Chicago." Nevertheless, Keating was convinced, as others were, of the wisdom of a canal to connect the Chicago River with the Illinois River, "an expenditure, trifling in comparison to the importance of the object, would . . . render Lake Michigan a tributary of the Mexican Gulf."

Congress had in fact in 1822 authorized construction by the State of Illinois of an Illinois River-Lake Michigan canal and the State Legislature, in February 1823, passed a canal bill which provided for five commissioners to lay out a canal route. The commissioners visited Chicago, according to Keating's account, some weeks after the Long-Keating party left. The commissioners eventually hired two civil engineers, Justus Post and René Paul, to survey the canal route, a task which they performed the following year. Toward the end of the decade the U.S. Army Topographical Engineers conducted a more extensive survey.

Through the eyes of Major Long, Henry Rowe Schoolcraft, Captain Douglass, and William H. Keating we are able to obtain an impression of the nature of the country, the routes of communication, the economy, and the way of life up to the year 1823 in an area which makes up what is today the Chicago District of the U.S. Army Corps of Engineers. In 1823 a new phase of activity by the Army Engineers on the Great Lakes began, at first on the eastern lakes with their more populated shores, but eventually on Lake Michigan as well.

Chapter 2



The frontier recedes: 1823-1833

An historic beginning toward improving conditions for navigation on the Great Lakes was made in 1823 when President James Monroe sent ranking members of the War Department's Board of Engineers for Fortifications to make a harbor survey of Presque Isle at Erie, Pennsylvania. Congress had authorized the survey by the Army Engineers. It was the President's idea, prompted by the strong interest shown by the State of Pennsylvania, to send a survey team which included General Simon Bernard, a former French officer and engineer in the Army of Napoleon Bonaparte, and Colonel Joseph B. Totten, who after 1838 served for 26 years as Chief Engineer of the United States Army.

The engineer officers reported that the harbor at Erie was one of the best on the lake and that commerce was growing there but that the entrance to the harbor was obstructed by a sandbar which could be eliminated by constructing piers in such a way as to direct the current so as to deepen the entrance. Based on this 1823 survey and estimate prepared by General Bernard and Colonel Totten, Congress in 1824 authorized \$20,000 for the improvement of the harbor at Erie, Pennsylvania.

The General Survey Act of 30 April 1824 gave the President wide discretion in initiating surveys, plans and estimates for such internal improvements as he might deem of national importance from a commercial or military point of view. The act did not authorize construction of projects but provided the means including funds for carrying out surveys and drawing up plans. Additional congressional



action would be required to implement the plans. The law authorized employment of two or more civil engineers as well as officers of the Corps of Engineers. It appeared under the act of 30 April 1824 that a national and comprehensive program of internal improvements could now be planned by the Executive Branch of the Government. The President appointed a Board of Engineers for Internal Improvements to oversee the program, but the Board continued in existence for only 8 years. In any event, the 1824 law was not the only authorization upon which surveys might be carried out. The report of the Chief of Engineers of 1829, for example, included reports of the status of 17 surveys being carried out under the act of 30 April 1824, while 18 surveys were being carried out as a result of special acts and resolutions of Congress.



In 1826 Congress allocated funds for the improvement of two additional lake harbors, the harbor at Buffalo on Lake Erie and the harbor at St. Josephs on the eastern shore of Lake Michigan. The Buffalo project provided for a loose stone wall breakwater, while at St. Josephs the project involved diverting the main channel of the St. Josephs River and forcing it through a new channel in such a way as to wash away a sandbar and thus provide for sufficient depth to allow the passage of vessels into the mouth of the river. St. Josephs was the first harbor to be improved on Lake Michigan. Work would not begin on the Chicago Harbor until 1833.

Meanwhile, the State of Illinois had not made great progress on the canal to connect Lake Michigan with the Illinois River. In 1825 the State authorized a private corporation to accept any land grants that

The startling growth of Chicago did not begin until two years after this 1831 drawing. After the Blackhawk War of 1832, in 1833, the first work on the harbor was begun, and Chicago quickly mushroomed into a busy port with one of the fastest growing populations on the Lakes.

might be made by the Federal Government and to build the canal. This authorization was repealed in 1826. In order to make financing the canal possible, in 1827 Congress passed the Illinois-Michigan Canal Bill which granted to the State one-half of the land to a depth of five sections on each side of the canal but reserved for the United States the alternate sections. The canal, according to the bill, was to be toll-free.

On 10 September 1829, using as authorization the Survey Act of 30 April 1824, Colonel Abert, Chief of the Topographical Bureau in the Engineer Department, in response to an application from the Legislature of the State of Illinois, informed Dr. William Howard of Baltimore, Maryland, that he had been selected to survey the most practical route for connecting the waters of Lake Michigan with the Illinois River. The survey was to commence at Chicago and proceed to the valley of the Des Plaines River at the head of the portage and continue down the valley of that river to the Illinois River.

Dr. Howard was one of two civil engineers employed at this time by the Engineer Department. When on duty he received \$6 a day and when traveling on orders, 12 cents per mile. The Department also employed several assistant engineers, among them F. Harrison, Jr., William B. Guyon and Henry Belin, all of whom were involved in the Illinois River-Lake Michigan canal surveys in 1830 and 1831. The assistant civil engineers received \$3.50 a day while in the field and 10 cents a mile while traveling under orders. Belin was paid the substantial bonus of an extra \$2 per day while employed in 1831 on the Illinois-Michigan survey due, perhaps, to the arduous nature of the task in what was at least in part a remote area of the country.

Dr. Howard traveled to Illinois in the fall of 1829, probably accompanied by assistant civil engineer Harrison. On 20 October 1829 Dr. Howard gauged the discharge of water in the Des Plaines River at Lawton's trading post. On 22 February 1830 he approved a map drawn by Harrison showing the course of the Chicago River and a proposed cut across the sandbar near Fort Dearborn, as well as a proposed dam to close the mouth of the river. Assistant engineers Harrison and Guyon carried out the survey work in 1830, at a time when Dr. Howard was on furlough from the Engineer Department. Both Harrison and Guyon became ill in the summer of 1830 and the survey was not completed. In April 1831 assistant civil engineer Henry Belin, under orders from the Chief Engineer, proceeded to Illinois to complete the survey. On 20 May 1832 he submitted his report which included 9 sheets of maps and as many tables.

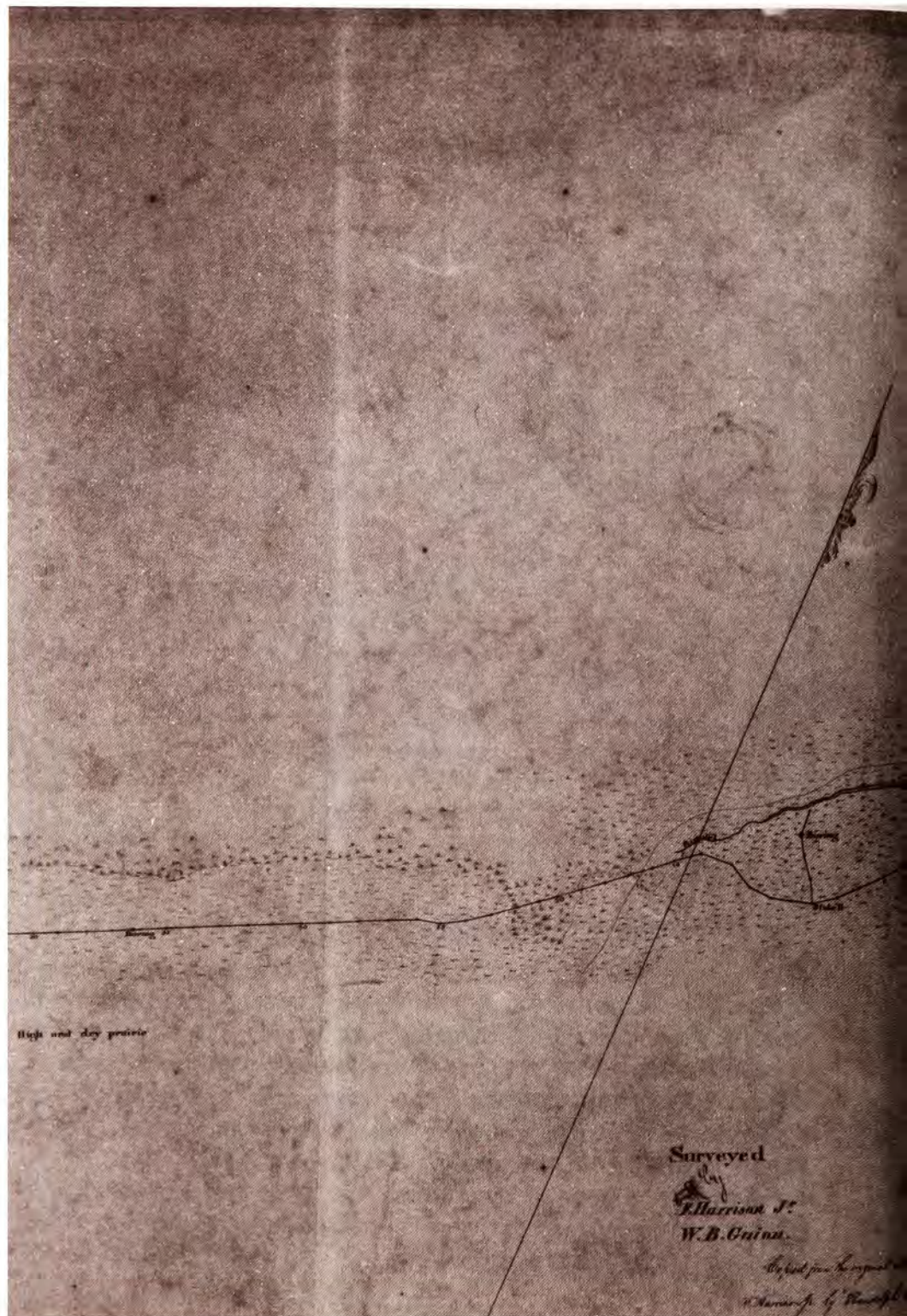


Colonel John C. Abert, Chief of the Topographical Bureau in the U.S. Army's Engineer Department, sent Dr. William Howard and F. Harrison, Jr., to Chicago to begin a survey for a water route connecting the waters of Lake Michigan with the Illinois River. They also prepared this plan for the improvement of the harbor at Chicago.

The route of the survey followed the general route of Long's survey of 1816. By 1832 the northern end of the old Chicago portage was still closed by a sandbar separating the Chicago River from Lake Michigan. At the southern end of the route, however, the Illinois River was being navigated by steamboat as far north, during high waters, as the Fox River. This is about 35 miles downstream from where the Illinois River is formed by the joining of the Des Plaines and Kankakee Rivers. At low water passage of steamboats thus far up the Illinois River was impeded by rapids which began 27 miles below the juncture of the Des Plaines and Kankakee Rivers and extended upstream for 15 miles.

The frontier
recedes:
1823-1833

In 1830 the survey of the proposed Lake Michigan-Illinois River waterway was continued under the direction of the Engineer Department by Assistant Engineers F. Harrison, Jr. and William B. Guyon who prepared this map of "Chicago Creek."





Map No. 1 of assistant civil engineer Belin's 1832 report covering work done by Harrison and Guyon in 1830 shows a survey of what he called the "Chicago Creek," together with 8.8 miles of the canal route. The map provides a graphic impression of Chicago in 1832, the text an insight into what was involved in the survey work. "The survey of Chicago Creek," Belin wrote, "commences at its mouth which is obstructed by a bar. At the time it was sounded in the summer of 1831, there was two feet water, but it is constantly altering and sometimes completely closed. From the bar the water of the lake gradually deepens and 445 yards from it there is 18 feet water. The creek from its mouth to Fort Dearborn, a distance of 40 yards runs parallel to the lake (course nearly north) from which it is separated by a narrow sand bank—its average width 100 yards the depth varies from 6 to 15 feet. From the fort to the village of Chicago the course is west, distance 1,150 yards average width 70 yards and from 15 to 26 feet deep, at this point the stream forks. From the village the main branch has a course of south for 3,200 yards, average width 60 yards depth 17 feet, thence to a point where a line of levels commence, the course is south of west, distance 5,230 yards, average width 44 yards, depth varying from 26 to 10 feet. The creek head (is) about 2,500 yards from the above-mentioned point in low wet ground which extends in a westerly direction for about four miles to Mud Lake which communicates with the River Des Plaines."

As a result of numerous treaties the Indians had ceded most of their lands in the State of Illinois by 1830. By a treaty of 1804 which ceded an area in the northwestern portion of the State in the basin of the Rock River, the Indians were permitted to live and hunt in their old lands until the United States Government should transfer title to individual purchasers.

Many Sauks continued to live undisturbed in the valley of the Rock River for 20 years or more but the route from the southern shores of Lake Michigan to the congested area of Galena, Illinois, and the lead mines there crossed the Rock River and exposed the Indians' fine crops to the eyes of land interested travelers. Some of these travelers, as early as 1827, entered a Sauk village and destroyed Indian property while the Indians were on a hunting expedition. More and more white squatters settled on former Indian lands and tension occasionally erupted into bloodshed. In 1831 several hundred Illinois militia joined by regular troops were used to convince the Indian leader Blackhawk that his band should join the Sauk and Foxes on the west side of the Mississippi River.

This was not the end of the matter for Blackhawk recrossed the Mississippi River and moved up the Rock River in April 1832 with 500 warriors accompanied by their women and children to plant corn, Blackhawk said, on their old fields. Their ultimate intention is not clear, but the move was the immediate cause of the Blackhawk War which followed.

Because of what was considered the threatening magnitude of the war the Commander in Chief of the United States Army, General Winfield Scott, was ordered west in June 1832. Steamers were engaged at Buffalo, New York, to transport United States troops to Chicago, Illinois. According to a contemporary source, of the 850 men who left Buffalo not more than 200 were fit to take the field upon arriving in Chicago. On reaching Fort Gratiot at the foot of Lake Huron, Asiatic cholera first appeared among the steamer-borne troops. General Scott traveled with his staff and four companies aboard the Sheldon Thompson, probably the first steamboat to navigate the length of Lake Michigan. On 9 July, the day before arriving at Chicago, six cases of cholera developed on board. The disease spread rapidly. Upon arriving at Chicago on 10 July the troops, many of them stricken with cholera, were brought to land in small boats because of the sandbar which continued to block the entrance to the harbor there.

With those troops which were fit for duty General Scott moved over the trail from Chicago toward the Mississippi River until he was halted by a new outbreak of the disease near Beloit. It was while stopping there that news of the end of the war reached him. The war ended early in August 1832 and Blackhawk surrendered on 27 August after most of his band had either been killed or dispersed.

As a result of the war thousands of militia men and regular military became familiar with the agricultural promise of the largely unknown area of northern Illinois and what was to become southern Wisconsin. In addition, excited reports not only of the war but of General Scott's arrival at Chicago reached the eastern press and called attention to the region. The immediate effect was to discourage settlement, but as an aftermath of the war, in September 1832 and again in September 1833, treaties were signed first with the Winnebago and then with the Potawatomi Indians which cleared the way to survey and settle northern Illinois and what eventually became southern Wisconsin. The Blackhawk War is recognized as marking the beginning of a new era for those lands immediately bordering Lake Michigan to the west and southwest.



Chapter 3

Five years' work on the Chicago Harbor: 1833-1838

In 1832 President Andrew Jackson vetoed a river and harbor appropriations bill which included funds for the improvement of the harbor at Chicago. However, on 2 March of the following year Congress appropriated \$25,000 for the harbor and responsibility for the improvement was assigned the Engineer Department then under the direction of Brigadier General Charles Gratiot. Because there was a shortage of engineers in the department, it was not possible to send an engineer officer to Chicago. The works were placed in charge of the Commander of Fort Dearborn, Brevet Major J. Fowle of the 5th Infantry. A Mr. Henry Handy, residing in Washington, D.C., was appointed by General Gratiot on 10 March as assistant superintendent. Major Fowle was sent a drawing of the harbor entrance showing the location of the intended works. The drawing and the plan for improvement were based on the report of 24 February 1830 prepared by Dr. William Howard. Major Fowle was soon replaced at Fort Dearborn by Major George Bender, also of the 5th Infantry. It was Major Bender who superintended the first year of construction on the Federal piers at Chicago.

In 1833 Chicago was mushrooming and already had a few stores and some primitive hotels. From the time in the spring when conditions made building possible, one frame and clapboard house after another was thrown up in the village. There was keen competi-

tion for the limited building materials, laborers, and provisions on hand.

Work on the Government project was overshadowed by preparations for the last and largest Indian council ever to be held at Chicago. The object of the council was to obtain from the Indians a large tract of land between Lake Michigan and the Rock River. Thousands of the Potawatomi Indians and allied tribes camped in wigwams on the surrounding woodlands and prairies and on the sand hills along the shore of Lake Michigan.

Carrying out the Federal harbor project at Chicago was handicapped in 1833 not only by shortages of necessary equipment, supplies, and skilled labor but by the lack of banking facilities and the fact that mail communications between the Lake Michigan outpost and the Capitol at Washington, D.C. were such that responses to letters requesting important guidance arrived months after requests for assistance were sent.

Neither Major Fowle nor Major Bender had had experience with engineering operations such as these and, though Mr. Handy proved deserving of his name, he too seems to have been unfamiliar with this type of undertaking. In writing from Chicago to Mr. Isaac S. Smith, superintendent of the harbor at Buffalo, on 22 May, Henry Handy conceded that "your experience will enable you to make a better selection of all the materials we shall want for the present season than any direction we could possibly forward. We shall therefor depend on you to select in minutia materials for the pile driver, ropes and cables, etc." Very little of what was needed could be found in Chicago. Smith was also to provide tow ropes for towing crafts from the quarry, quantities of bolts of various descriptions, iron bars, iron braces, etc. He was also to employ for them a Mr. Jackson who was to attend to the pile driver, a carpenter to build the pile driver, cranes, crafts, etc., and a man capable of laying the cribs. The carpenter was to come as soon as possible; the others were to travel west with the materials.

Timber, stone, and unskilled workmen were to be procured locally. On 20 May an advertisement for proposals was circulated in Chicago for timber and stone which directed that the sealed proposals should be addressed to Major Fowle or Mr. Handy and be left at W.W. Wattles tavern before 20 June.

Writing to Isaac Smith at Buffalo and advertising for bids for timber and stone were all that could be accomplished by 19 June when Major Bender arrived to take over command of Fort Dearborn and the Federal harbor project. On taking over, Major Bender immediately wrote General Gratiot of his impressions of the project,

pointing out that the estimate provided by Dr. Howard would probably be exceeded because of the difficulty of obtaining timber at reasonable prices, and that he had no funds on hand for carrying on the work. He would need \$3,380 for July expenses including \$60 for the master carpenter, \$300 for 20 laborers and an additional \$300 for oxen and horses.

The proposals which had been left at Wattles tavern were opened on 21 June. Major Bender found them too extravagant and indefinite to be considered. An advertisement for new bids was circulated. This time "The quantities . . . were made small with the view of ascertaining the resources of the country." Eventually two contracts were let, one with Charles Jackson for 500 30-foot logs, 14 inches in diameter and hewed on two sides, for \$3.75 per log. A second contract was signed with Bayer and Spence for 2,000 cubic yards of stone at \$1.90 per yard.

"The persons contracting," Major Bender later wrote to General Gratiot, "have served as pioneers and having been successful it has created great desire in others to engage in the business. . . . The prices hereafter, particularly of the logs, will be greatly reduced."

By 9 July the skilled workmen and most of the supplies had arrived from Buffalo on the schooner "Austerlitz." Other supplies were transported on the steamboat "William Penn" and the schooner "LaGrange." Major Bender wrote to General Gratiot on 9 July "I find myself so totally cut off from all intercourse with anyone who has had hard practical experience in work of this nature, and so long time will elapse before I can get your advice thereon that I am exceedingly at a loss what course to adopt." Major Bender's dilemma grew out of his conclusion that a dam at the river's mouth as visualized by Dr. Howard and recommended by the Engineer Department would not, though it be built to 400 yards in length, raise the water behind it more than 1 foot. A dam should be constructed, Major Bender believed, 700 or 800 yards from the mouth as an extension across the river toward Fort Dearborn on the southern of the two contemplated piers.

When the men dug in various parts of the bar between the contemplated piers "quicksand and water (would) . . . flow in immediately on reaching the level of the lake and river." Major Bender requested the Chief Engineer to advise him as to whether the piers should be placed before or after the cut was made. If before, "I fear that when the channel is opened they (the cribs) will tumble inwards. I must decide on some course of action as soon as my timber comes to hand. I shall hope to be excused if I fail in judgment in a matter so new to me."

Major Bender could not know at that time that because of mail difficulties a response to this 9 July appeal for guidance from Washington would not arrive at Chicago until 9 September. Nevertheless, there was no idle waiting. Major Bender's first efforts on arriving had been to begin construction of a storehouse for materials and of a shanty for the workmen "to cook and quarter in." Because of the difficulty of procuring timber these tasks were not completed until the end of July. While waiting for materials the men burned charcoal for blacksmith work and made the preliminary excavations on the bar referred to above. In addition, they built a skiff, a yard boat, 12 wheelbarrows, and a crane scow. The frames of a pile driver scow and a second crane scow were still in the stocks unfinished for lack of materials when the season ended.

Most of the outdoor work was overseen by Handy. "My duties as commander of this post are so incessant," Major Bender wrote General Gratiot, "that I can not find so much time to attend to the Harbour as I would wish." A young gentleman, Mr. A.V. Knickerbocker, was hired at \$30 a month to take care of the accounts, transcribe letters, and perform other similar duties.

Only a few laborers had been employed by early August, "it being almost impossible to hire from the great demands and rate of wages." Carpenters were receiving \$1.50 to \$1.75 per day. A circular of 20 July offering to hire immediately 40 able-bodied men at \$15 a month and board brought in such workmen, 12 in all, as were satisfied with the provision that "Hands working at the harbor will be furnished with as much hop and ginger beer as they may require but no ardent spirits."

At the end of July, to settle accounts with Mr. Smith of Buffalo, Major Bender wrote him of what appeared to be deficiencies and discrepancies in the articles received. He asked clarification, for example, on such matters as the number of pounds and the price per pound of the grindstone which had arrived.

On 7 August a new problem developed. The pile driver hammer which had been sent from Buffalo was deficient and Major Bender lost no time in writing to Isaac Smith of this discovery. Fortunately an old hammer was located in Chicago and it was hoped that it could be used.

"I am embarrassed for the want of funds," Major Bender wrote to General Gratiot on 5 August. "I have been obliged to make purchases of lumber and other materials for building the pile driver, scows, storehouse and workshop almost as fast as the proper kinds were brought to market. The demand for these supplies is very great in

consequence of the numerous buildings that are erecting about the town. The suppliers (are) men without capital, who must be paid immediately. This has compelled me to endorse their accounts to enable them to raise money on them among the storekeepers. . . . The demand among our workers will also soon become urgent." In the same letter of 5 August Major Bender also informed the Chief Engineer that he would soon be able to begin construction of the south pier and that his plan of operation was "not to cut through the bar until nearly having finished damming the river (near Fort Dearborn) to deepen the water . . . so that our scows and pile driver may . . . gradually advance through the present bar."

Before the 5 August letter could be mailed a Treasury warrant arrived to cover Major Bender's July expenses but, as he added in a postscript to General Gratiot, since the warrant was drawn on the U.S. Branch Bank of St. Louis it was useless to him. Checks, however, on banks at Detroit, Buffalo and New York "would be instantly cashed by merchants here with the view of remitting them in payment of supplies."

Beginning on 12 August at the Fort Dearborn wharf, crib work was placed across the river with the object of forcing the river to empty itself across the bar instead of at its mouth 700 to 800 yards farther south.

Meanwhile, Mr. Smith, indignant concerning Major Bender's "eagle eye" in reference to materials received from him at Chicago, wanted to be paid for his services and for the materials. In addition, he wanted a 2-percent commission, 2½-percent interest on money advanced to the carpenter and the pile driver operator, as well as 7 percent on the total since 20 June. Major Bender, still without funds for the project, and not knowing of the legality of the interest being charged by Mr. Smith, referred the entire matter to General Gratiot in Washington.

On 2 September Major Bender received a new warrant from the Secretary of the Treasury, this time for \$6,290 and directed to the Branch Bank of the United States at Louisville, Kentucky, even more inaccessible than St. Louis. "I cannot avail myself of it . . . (and) I am not authorized to sell the warrant at a discount, even if I could find a purchaser for it in this place."

Major Bender received a response to his request for guidance of 9 July on 9 September. His plan of procedure was not endorsed by the Department which assumed that he had proceeded in constructing a dam at the mouth of the Chicago River. Since 12 August he had placed cribs halfway across the river at the upstream point which he

had selected. It would be costly and wasteful, he felt, to change the operation at this late date to conform with the original concept, and he decided to continue with the work according to his own plan.

On 6 October assistance in alleviating the ever-increasing burden which grew out of the complete lack of funds at his disposal came to Major Bender from an unexpected quarter. Mr. Charles C. Trowbridge, who as a young man of 20 had accompanied Governor Cass, Henry Rowe Schoolcraft, and Captain David Bates Douglass on the 1820 expedition through the Old Northwest, had now, by 1833, become a successful Detroit banker. Having heard of Major Bender's difficulties, Trowbridge obtained the Treasury warrant on the U.S. Bank in Louisville and credited it to an account opened in Detroit for Major Bender. In informing Major Bender of the transaction Trowbridge also offered to accept the warrant on the St. Louis Bank. Major Bender could write to General Gratiot on 8 October that as a result of arrangements at Detroit he was able to "struggle on with the work for a short time, perhaps to the end of this month."

Shortly thereafter Major Bender resigned from his assignment as Commander of Fort Dearborn, leaving the business of the Federal harbor at Chicago in the hands of Assistant Superintendent Handy. When three letters arrived from Washington for Major Bender on 23 November, mailed on 2, 4, and 19 October, Major Bender was no longer in Chicago. The mail had been detained at Rockway River, Illinois, with 6 weeks of other mail.

In writing of these circumstances to General Gratiot Mr. Handy used the opportunity to pass on some advice to the Chief Engineer concerning operations for the coming season. He called attention to the necessity for contracting for timber for cribs that winter. Pine timber, he believed, could be obtained from the Calumet (Calumet) River where lumbering operations were under way by trespassers on Government land. He also thought sufficient good oak timber for piling could be obtained within 8 or 10 miles of Chicago on the banks of the Chicago River and that these could be drawn down to Chicago on the ice or floated there in rafts during the high water in the spring.

"Next season this timber will all be taken up and cannot be had for double the present price." One hundred teams, he explained to General Gratiot, would be idle during the winter and timber could be had cheap. The same applied to stone which could be quarried and brought to the river while the ground was frozen. Contracts, Handy believed, should be made during December so as to embrace the months of January and February.

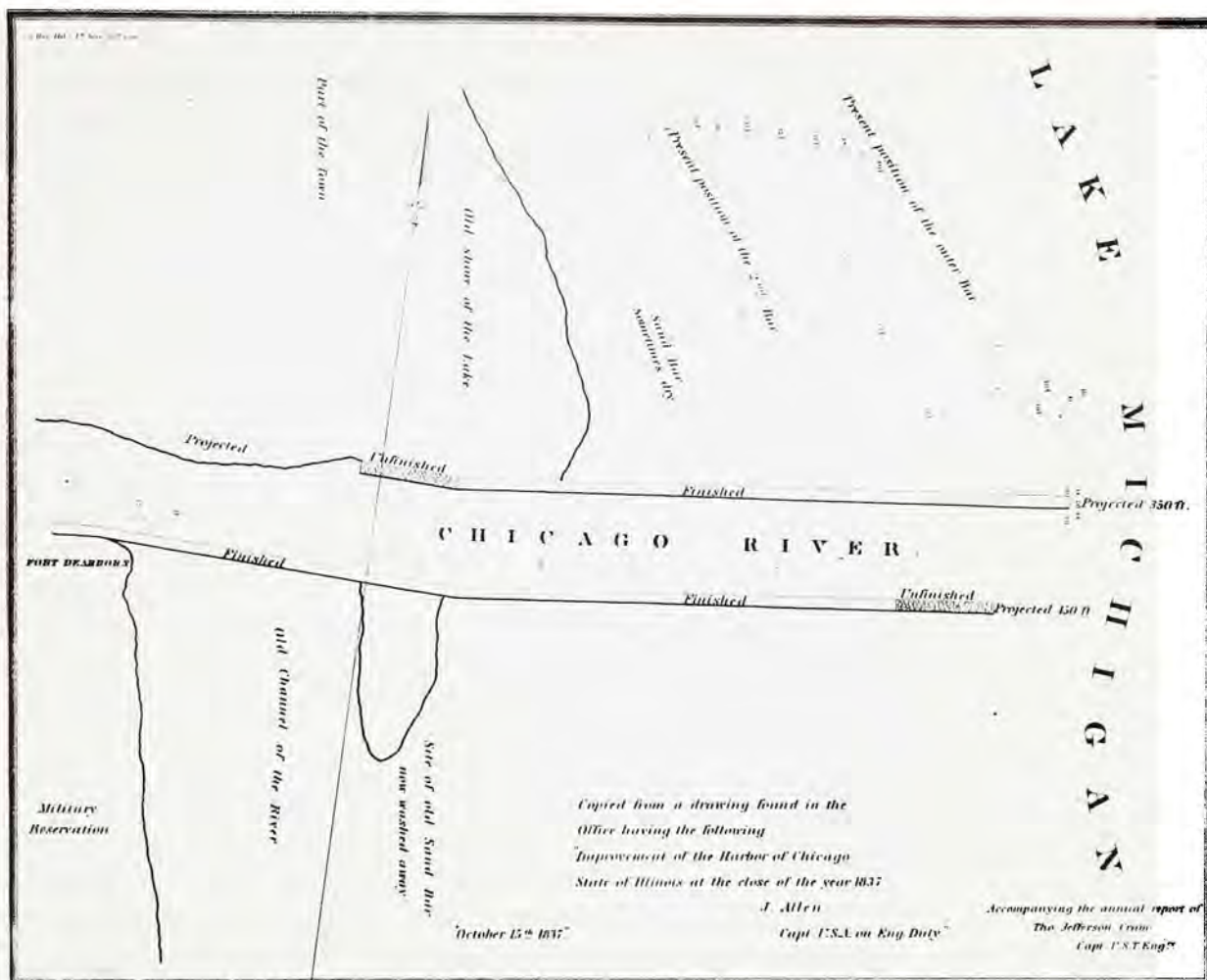
"I would suggest propriety of purchasing the pork and beef that may be required next season as soon as possible for the reason that the emigration to this place and the neighboring country will be such next season that provisions will be extremely high. The treaty continued so long this fall and the number of Indians and whites were such that provisions are now as high as in Washington City. Hogs and beef can be bought at a very low rate within one hundred and 20 miles from this place and driven on foot and slaughtered at or near Chicago. By so doing nearly one half of the expense could be saved for provisions."

Mr. Handy also asked General Gratiot for guidance as to what should be done with the dozen or so workers who were still employed on the project largely because he had no funds to pay them off. They were willing to stay on at \$14 a month removing sand from across the bar and placing it behind the south pier, which had by now been built completely across the river, so as to make it more effective as a dam. During wet days, he explained, the hands were employed in excavating under the warehouse and office where they had made very comfortable winter quarters without much expense. It was impossible, he found, "for hands to winter in the old shanties as they were entirely open and cold." The lumber from the old shanties was used to build a shed to protect the pile driver.

Thus ended the first season of operations designed to improve the harbor at Chicago. General Gratiot's annual report, after summarizing the difficulties, commented, "A commencement in a position like this is, however, of great value, and hopes are entertained of being able to prosecute operations with advantage during the next working season."

On 10 January 1834 General Gratiot wrote Second Lieutenant James Allen of the 5th Regiment at Fort Dearborn that he was to be assigned temporary duty with the Engineer Department in charge of conducting the work for creating a harbor at Chicago. "It is known," the General wrote the 28-year-old Second Lieutenant, "that there is a probability of your meeting with some difficulty in the prosecution of your operations." As compensation Lieutenant Allen would receive 80 cents per day in lieu of food and quarters that he would have received as a matter of course when assigned to a garrison. In addition he would receive 2½-percent of the amount of funds he distributed but not to exceed \$2 a day. Lieutenant Allen remained at this temporary assignment with occasional breaks until the close of 1838.

In 1834, 1836, and 1838 Congress did not provide funds for the Chicago Harbor until late June or early July, very late compared with



the early March appropriations of the alternate years. Since appropriations could never be assumed, major work on the project during years of later appropriations could not be commenced until July or later. Contracts which required lead time for such materials as wood and stone could not be finalized until the funds were assured. In 1834 the late appropriation of \$38,801 on 28 June was not entirely a disadvantage. Lieutenant Allen had plenty of time to survey the scene, make plans, and iron out differences with his superiors.

With funds remaining from the 1833 appropriation, Lieutenant Allen kept "four common hands and two principal workmen employed making wheelbarrows and other implements" and when weather permitted "in completing the scow for the pile engine..." His plan, when the appropriation of funds was received, was to continue to

Major George Bender of the 5th Infantry was in charge of harbor improvements at Chicago in 1833. From 1834 through 1838 the work was carried out by Captain James Allen of the Dragoons. Captain Allen prepared this map of the Chicago Harbor in 1837. Both officers were responsible for their harbor activities to the U.S. Army Engineer Department.

Five years' work on
the Chicago Harbor:
1833-1838

work on the north pier and to extend it "as far as the season and funds may permit. . . ."

The south pier which had been constructed across the river under Major Bender's supervision in 1833, though ineffective as a dam at low water, was instrumental, during an unseasonal 24-hour rain on 13-14 February 1834 which raised the river 3 feet, in directing the flow of the swollen Chicago River across the sandbar into the lake, thus creating a channel on the north side of the south pier. This new channel was 30 or 40 feet wide and 10 to 12 feet deep. Lieutenant Allen estimated that about one-half of the river's volume was now flowing into the lake through the new channel.

On 26 February Lieutenant Allen wrote General Gratiot of these developments and explained his plan for constructing the north pier. The pier would be constructed of a series of cribs 30 feet long. The portions of the cribs to go underwater would be built of pine timbers formed together on or near the shore, floated to their place in the pier and then sunk. The bottom of each crib was to be open except for a few cross logs. Stone resting on these logs would hold the crib firmly in place while the remainder of the stone would be free to drop into such open space as might develop there. The settling stone would keep the cribs from tilting.

To further prevent tilting, cribs were to be held in place by 12-inch square piles driven in at 12-foot distances on the inside of the crib. The pine or underwater portion of the cribs would be constructed so as to come within one log width of the surface of the water. The structure would be built up, after it was in place, with oak timber to a height 7 feet above the surface of the lake.

Nearly 2 months passed before a response from the Engineer Department to Lieutenant Allen's plan could reach Chicago. His plans were approved except that the Department directed putting floors in the cribs to prevent the stone from escaping. Lieutenant Allen persisted in his opinion and on 29 April and again on 14 May recommended that "Flooring of the cribs . . . be omitted as not being adopted . . . to the circumstances of the work." On 2 June Lieutenant Allen was authorized to carry out his plan for the north pier "so far as the means available . . . will enable you to do so."

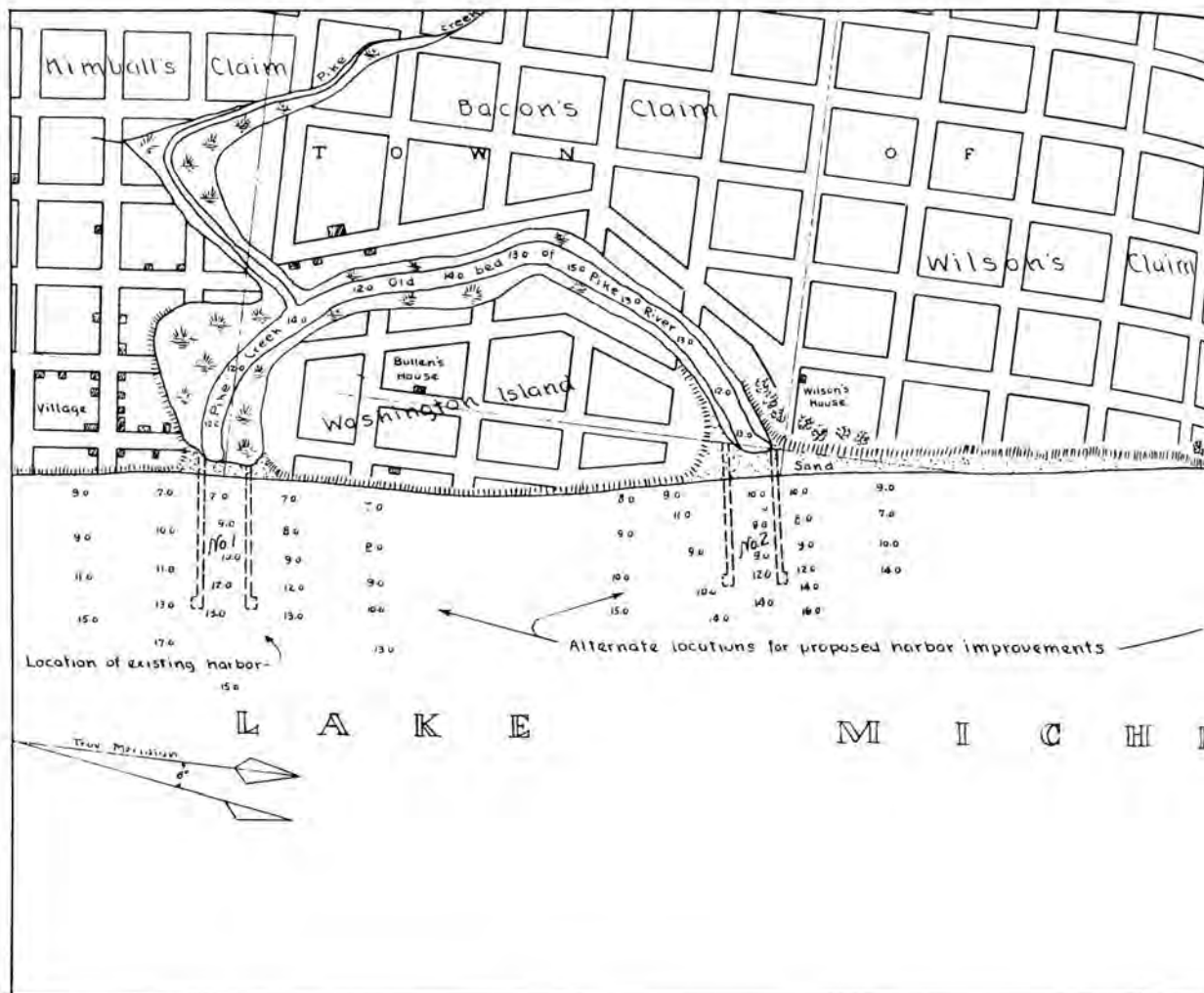
This exchange of correspondence between Second Lieutenant Allen and Brigadier General Gratiot illustrates the freedom with which a junior officer might successfully recommend an alternative procedure from that which he had been directed to employ. There was at this time no engineering board to which matters such as these might be referred for a decision.

Although funds were appropriated on 30 June and work could begin on the north pier on 30 July, very little was accomplished in August 1834 because of unusually unfavorable weather. Nevertheless, in his annual report to the Secretary of War on 1 November 1834, General Gratiot was able to report that the Chicago Harbor operations had "progressed in a most satisfactory manner considering the late period at which the appropriations became available, and the difficulties in a country just emerging from a state of wilderness." He pointed to the "increasing commerce of the west." He told of the 180 vessels which had arrived and discharged their cargos at Chicago during the 1834 navigation season and recommended that the harbor "be perfected as rapidly as circumstances will permit." (388)

Before the year was out Lieutenant Allen faced two more problems. One, relatively minor, he solved. The second was beyond his control and remained the cause of concern for some time to come. In his estimates for expenses in the coming year \$100 had been included for bedding. This was challenged by the budget reviewers in Washington. Lieutenant Allen successfully argued his point by explaining, "I have been obliged to furnish bedding, sleeping apartments and boarding for all the men, now engaged on the harbor. . . . It was not practical for me to hire men without it, most of the laborers who come here to hire come from a distance and do not bring bedding—frequently too their money is exhausted in reaching the place." Furthermore, he reported, "To retain my hands . . . I was obliged on the first of September to increase the wages of common laborer, from \$15 to \$18 per month." The Budget Department accepted his explanation.

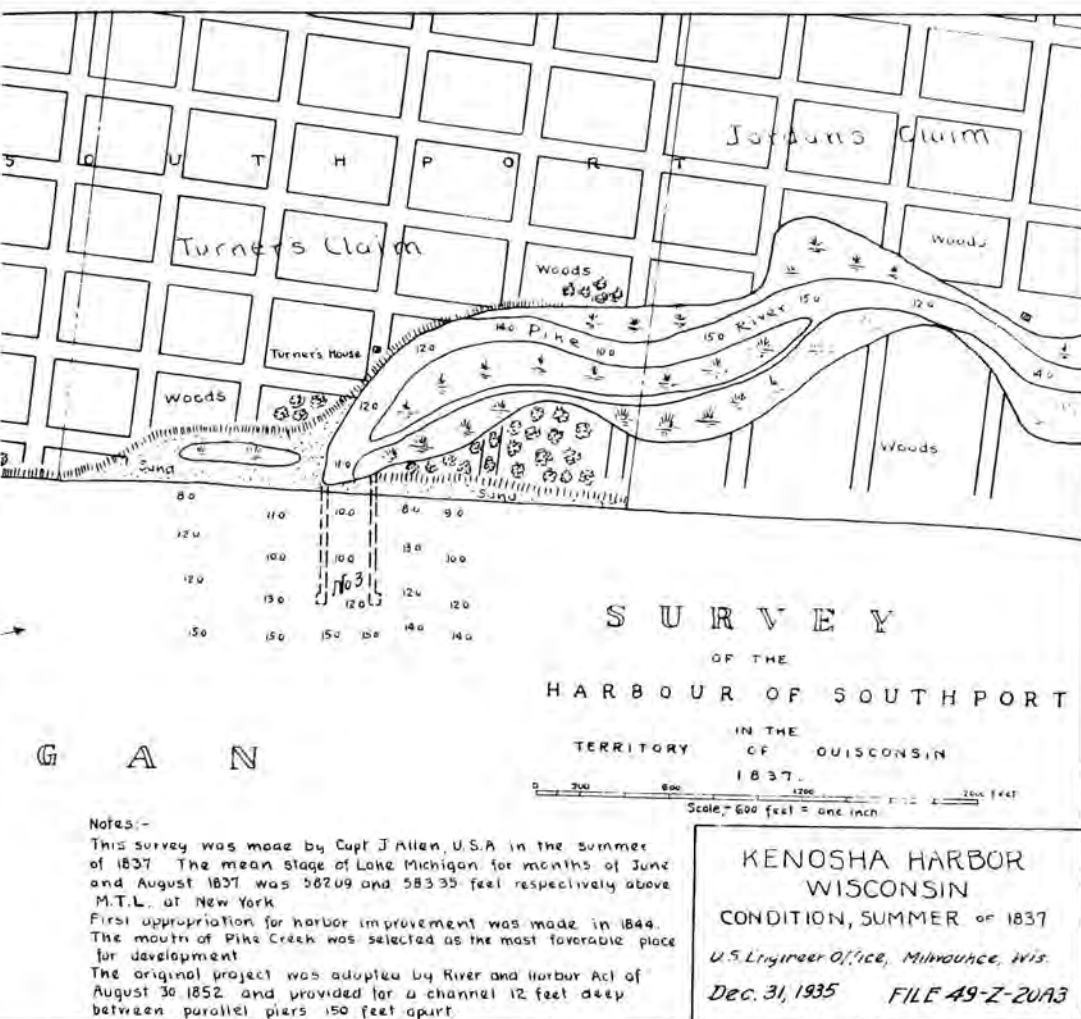
The second problem involved obtaining reliable bank notes to meet his commitments to laborers and contractors on the basis of the Government warrant he received from Washington. He complained that he "must endure taking and circulating . . . a motley kind of money of which I can know little or nothing." At this time the Bank of Michigan notes were considered sufficiently reliable but even these were not easily available in Chicago.

In March 1835 an additional \$32,000 was appropriated for the Chicago Harbor and work progressed rapidly throughout the construction season. By the end of September the north pier had been extended to 1,260 feet, the south pier 700 feet. Between them a channel 200 feet wide varied in depth from 3 to 7 feet. The next object was to deepen the channel by dredging. Even in its incomplete state vessels were already discharging their cargos under the shelter of the piers. Upwards of 200 vessels had arrived at Chicago during the 1835 navigation season.



On 14 October Lieutenant Allen reported to the Engineer Department on the necessity of acquiring a dredging machine. He planned to travel to Albany, New York, during the winter to make arrangements for the construction of the machine. He could safely leave the works at Chicago. Thirty-two men employed by him and 4 teams were operating under the supervision of a foreman in the woods some 12 miles from the city getting out oak timber for next season's operations. As so often in these years the mail was delayed or inexplicably lost. After 10 weeks, on 5 January, with still no reply from Washington, Lieutenant Allen proceeded first to Albany to make preliminary arrangements for the dredging machine, then to Washington for approval of his plans and returned to Chicago on 16 April.

Before the end of May 1836 the work on the harbor was well



In addition to carrying out harbor work at Chicago under the direction of the Engineer Department, Captain Allen made surveys in 1836 of the Calamick (Calumet) and in 1837 of the Southport (Kenosha) Harbors. For the surveys Captain Allen reported to the Topographical Bureau which, since 1831, was directly responsible to the Secretary of War. This 1837 survey map of the Southport Harbor was redrawn in 1935 at the Engineer Office then in Milwaukee.

advanced but funds from the previous year were all but exhausted, and this was to be a year of late appropriations. Workmen and laborers sought employment elsewhere and were committed by the time the 1836 appropriations became available in Chicago. In addition, "boisterous and unfavorable weather" prevented any further extension of the north pier, although the south pier was extended 150 feet by September.

While waiting for the arrival of the dredging machine Lieutenant Allen spent part of the season on a special assignment, a survey of the Calamick (Calumet) River. His report of survey which was submitted on 1 December to the Topographical Bureau recommended the Calamick Harbor for improvement as an alternate to Chicago in times of storm and spoke of the possibility of linking the Calamick

Five years' work on
the Chicago Harbor:
1833-1838

River with the Illinois River-Lake Michigan canal. Two days later, as a result of an order relieving him from Engineer duty and returning him to his unit, Lieutenant Allen selected Mr. A.V. Knickerbocker as temporary superintendent of the project and turned over to him the care of all the Government property involved along with five men employed to care for the machines, scows, and teams.

Lieutenant Allen's reassignment as superintendent of the Chicago Harbor project on 10 April 1837 followed a 3 March appropriation of \$40,000 for the project. But Lieutenant Allen had meanwhile reported for frontier duty at Leavenworth, Kansas, and was not able to return to the project until 13 June. The only new construction accomplished during the year was the addition of 200 feet of cribbing and stones to the south pier. Stone was also added to the north pier, and the dredging machine opened a channel 80 feet broad, with a minimum depth of 10 feet, along the inner side of the south pier by the end of the season. While the project was nearing completion a new problem was developing. Sand was accumulating at a fast rate to the north of the north pier. It was feared that this sand would eventually encroach on the entrance of the harbor.

Since 1837 was a year of a financial panic, the most vexing problems arose in attempts to obtain funds. By May most banks had suspended payment in specie; i.e., silver or gold coins. The Secretary of Treasury, Levy Woodbury, recommended, and President Van Buren approved, a policy whereby those involved in dispensing public funds would use only such banks as continued specie payments or, at the very least, assured that withdrawals could be made in the same bank notes as had been deposited.

Since banks in Detroit and New York which had been used by Lieutenant Allen had suspended specie payments, he requested of Washington that receivers of public money at the land office at Milwaukee, or some other nearby point, be directed to cash Treasury warrants drawn in his favor. On 20 July, Captain (since 30 June 1837) Allen dispatched Mr. A.V. Knickerbocker to Detroit with a draft for \$11,200 and instructions to demand payment in specie from the State Bank of Michigan. Failing this, he was to proceed to some neighboring land office and request the receiver of the public monies to pay out the sum in specie. Later in the year, on 2 September, Captain Allen dispatched Mr. Knickerbocker on a similar errand, this time to the land office at Ionia, Michigan, with a Treasury draft for \$9,000.

Early in 1838 Captain Allen was withdrawn from the works at Chicago for the special duty of conducting a detachment of troops from Detroit to Fort Winnebago. Appropriations were not made for the

harbor until 7 July when \$30,000, only half of which was to be spent in 1838 and the remainder to be left for the following year, was appropriated. Captain Allen applied the funds, which only became available to him on 1 August, to widening the channel between the piers with the dredging machine. Whenever weather permitted the dredged sand was placed on lighters or small boats which carried it out into the lake where it was dumped. In addition, he extended the north pier backwards, inshore from the lake, 600 feet to prevent sand from washing into the river.

On 7 September 1838, with the same mail which announced that he would be returned to the Dragoons and frontier duty at Leavenworth, Kansas, Captain Allen learned that by a decision of the Secretary of War the improvements at Chicago, as well as others on the lakes, were to be transferred from the direction of the Engineer Department to the Topographical Bureau. In his final report on the harbor, on 20 September 1838, to Colonel Abert, Chief of the Topographical Bureau, Captain Allen, after explaining that "The harbor at present affords an easy entrance and secure shelter in the worst weather to the largest class of boats and vessels engaged in commerce of the lakes," warned of the sand accumulating on the weather side of the north pier and which threatened to obstruct the harbor entrance. "This being the only shelter for a distance of more than 300 miles on the weather side of ... (the lake) the greatest solicitation is felt for its continued improvements and permanent security by all interested in the extensive navigation on this lake."



Chapter 4

The first general superintendent: Captain T.J. Cram, 1839-1843

In April 1839 the Topographical Bureau assigned Captain Thomas Jefferson Cram, an 1822 West Point graduate, to be general superintendent for harbor works on Lake Michigan and roads in Wisconsin Territory. He set up his headquarters at Racine at the mouth of the Root River in Wisconsin Territory. For the first time all civil works activities of the United States Army on the shores of Lake Michigan were placed under the direction of a single office. First Lieutenant Howard Stansbury and Second Lieutenant Lorenzo Sitgreaves were assigned to assist Captain Cram. All three officers were from the Corps of Topographical Engineers which had been formed on 7 July 1838.

The new Corps had been established, in part, to eliminate the need for temporarily assigning officers from the Artillery or Infantry branches to Engineer duty. Assignment of engineering duties as an added responsibility to Major Bender, who continued to command Fort Dearborn while superintending the construction of the Chicago Harbor, had, in 1833, not been satisfactory. Although Captain James Allen of the Dragoons had performed well as superintendent of the works at Chicago from 1834 through 1838, he had been threatened with recall to his unit on several occasions and when he finally returned there the experience he had gained at Chicago was lost to

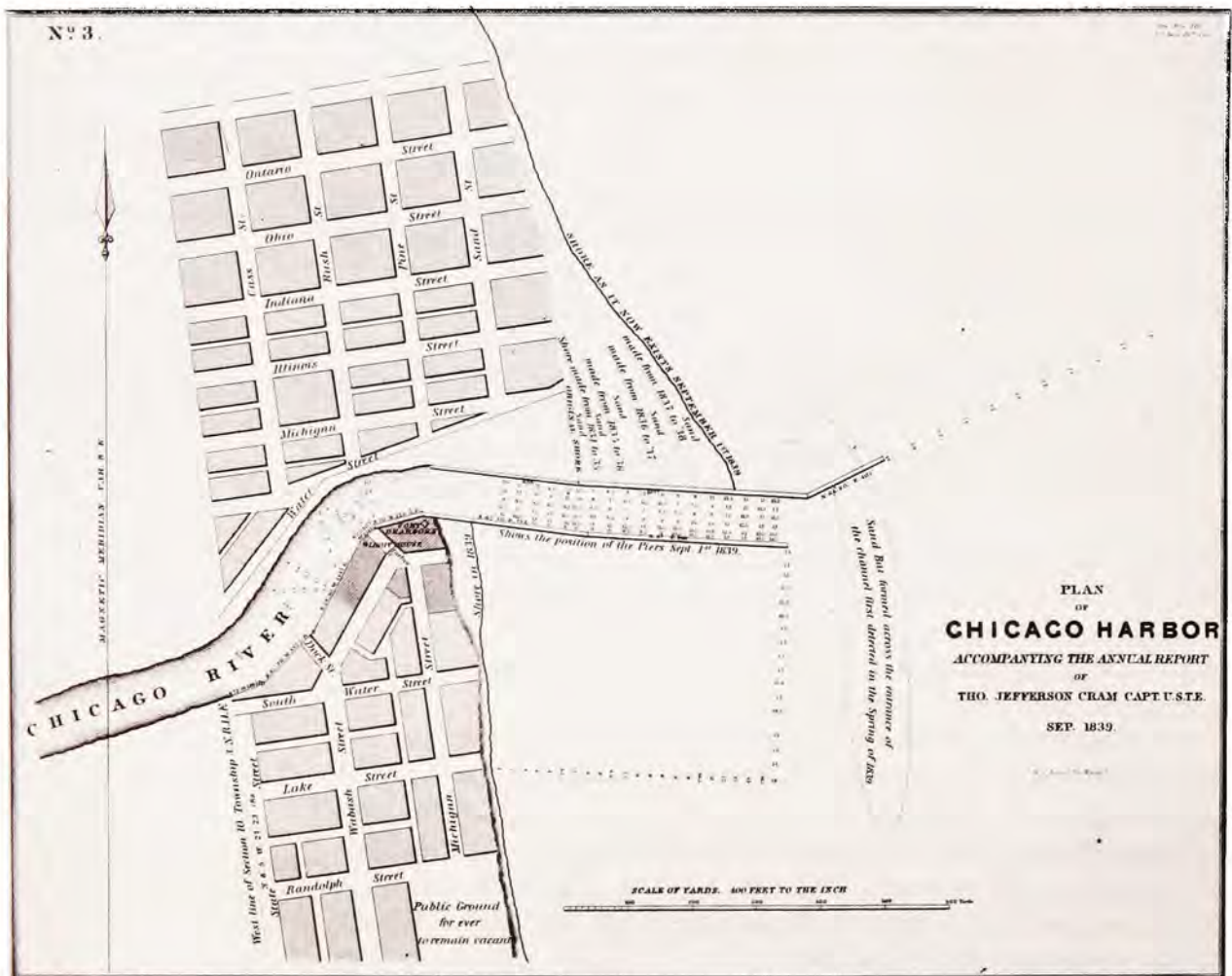
the Engineer Corps. The use of civilians as authorized by the General Survey Act of 30 April 1824 had been helpful. Men like Dr. William Howard of Baltimore, Maryland, who surveyed the Chicago Harbor in 1829, and John N. Berrien who continued, after resigning from the Army in December 1836, to oversee harbor surveys on the lakes for the Topographical Bureau from his office in Detroit had performed invaluable service. But civilian engineers were said to cost the Government more than Engineer officers and their integration into the military chain of command presented special problems.

The establishment of the Corps of Topographical Engineers in July 1838 to consist of one Colonel, one Lieutenant Colonel, four Majors, and ten each of Captains and First and Second Lieutenants allowed for more efficient management of the civil works responsibilities of the War Department. Colonel John C. Abert as Chief of the Corps of Topographical Engineers could establish regional offices in areas where a number of undertakings were being carried out and assign them to experienced Topographical Engineer officers. Civilian United States agents frequently selected on the basis of their honesty rather than their engineering skills were used to oversee the day-to-day operations at specific locations.

Developments at the Chicago Harbor project illustrate how the new system worked. Captain James Allen was relieved of his engineering responsibilities at Chicago and returned to his unit in September 1838 at the same time as the Chicago project was turned over to the Corps of Topographical Engineers. Captain Allen recommended Mr. A.V. Knickerbocker as U.S. agent in charge of the harbor works but other considerations overruled this choice.

A Mr. Andrew A. Humphreys was waiting in Philadelphia for the United States Senate to act on his 7 July 1838 appointment as First Lieutenant in the Topographical Corps. Colonel Abert assigned the Chicago project to Humphreys, but before he could move to Chicago his appointment was confirmed, in March 1839, and he was assigned to survey work on Lake Ontario. Mr. James H. Leavenworth, already an agent for the Quartermaster Department at Fort Dearborn, was appointed agent for the Topographical Bureau at Chicago on 1 April 1839. Leavenworth operated under the direction of Captain Cram at Racine.

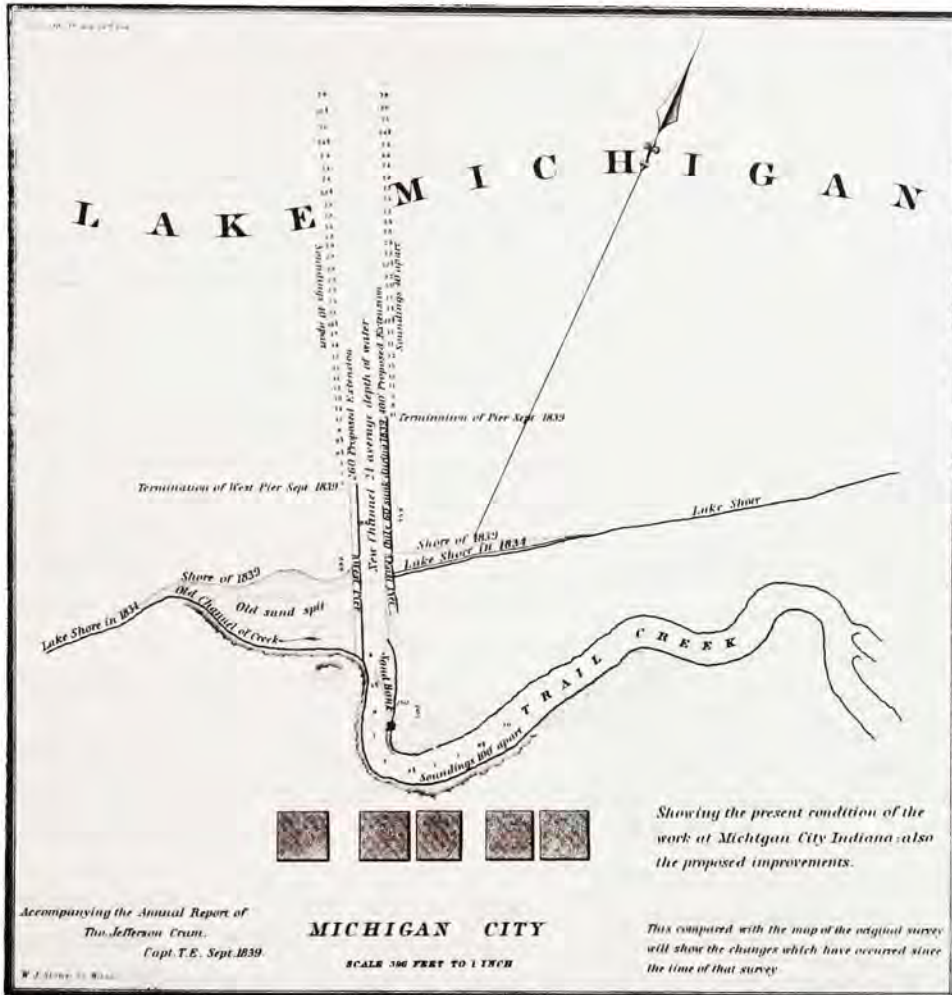
With funds remaining from the 1838 appropriation, in the summer of 1839 a sandbar was removed by dredging from the Chicago Harbor entrance. In addition an extension of 405 feet was made to the north pier. The extension angled off in an east-northeast direction from the rest of the pier, which ran 3° south of east. The change of direction



Captain Thomas Jefferson Cram set up an office for the general superintendency of harbors on Lake Michigan at Racine in Wisconsin Territory in 1839. This map of the Chicago Harbor which accompanied his 1839 annual report shows the change in the direction made in 1839 to the north pier as well as the contours of a sandbar which had been removed that year.

was recommended by Leavenworth as a measure designed to slow down the accumulation of sand at the mouth of the harbor. In addition, in November 1839, the Topographical Bureau acquired part of old Fort Dearborn for the offices and shops of the harbor works. The fort meanwhile had been deactivated.

When Captain Cram visited the harbor works at Chicago in the fall of 1839, he was not satisfied with the work which had been accomplished there prior to his arrival. "The position of the piers . . . (is) such as to compel a vessel on entering at times of severe storms to move with winds abeam." The width, 200 feet, between the piers was too narrow. The south pier was too long since "Vessels on missing the entrance during the action of the north winds have been unable to round to and come in without striking the extremity of the pier." He believed that stone rather than wood should have been used as



A harbor project was commenced at Michigan City in 1836 under the supervision of Lieutenant T.B.W. Stockton. Unlike the Chicago Harbor, the harbor work at Michigan City was under the direction of the Topographical Engineers from the very beginning. This map which was prepared by Captain Cram in 1839 shows changes in the lake shore as well as the then present condition of the work and proposed improvements.

much as possible for the superstructure above the water. An appropriation of \$25,000, he maintained, was necessary to preserve the works and to meet "the immediate necessities of trade at Chicago."

In addition to the harbor works at Chicago Captain Cram was responsible for similar undertakings at St. Joseph, Michigan, on the eastern shore of the lake where he was more satisfied with the direction of the piers and recommended their extension, and at Michigan City, Indiana, at the southern end of the lake. Since the first appropriation of \$20,000 in 1836 some \$110,000 had been expended in the construction of two parallel piers at Michigan City. During 1836 and 1837 the harbor project there had been carried out under the direction of Lieutenant T.B.W. Stockton who reported to the Topographical Bureau. Captain Cram found the average depth of water between the piers to be only 2½ feet. Scows had to be used to load and unload vessels

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outside the harbor. A dredge was being constructed to deepen the channel but the contractor had not yet completed the engine. No use would be made of the dredge in 1839 or, as it turned out, for many years.

Based on the expanding commerce on Lake Michigan Captain Cram provided justification for continued Federal support of these projects. "In 1833 the building of Chicago was begun; now after the lapse of only six years it numbers from five to six thousand inhabitants. During the present year eight steamers averaging 600 tons each are making regular trips between Buffalo and Chicago and two of less tonnage between Chicago and the towns on the east side of the lakes. Besides these there are several ships, brigs and large schooners plying regularly to and from Chicago." "The present Chicago," Captain Cram added, "is but the nucleus about which there will grow up, at no remote period, one of the most important commercial towns upon the lakes. . . . The commercial interests in all the states that border upon the lakes is intimately connected with Chicago as a place of transshipment and deposits."

In 1839 there was an active to and fro of vessels between Chicago and St. Joseph. St. Joseph exported furs, bacon, flour, whiskey, pork, wheat, corn, oats, pig iron, castings, hides, skins and lumber, as well as "many parcels of household goods, farming utensils, provisions, cattle, horses, wagons, etc., belonging to emigrants to Illinois, Wisconsin, Iowa and Missouri."

Michigan City, in the 12-month period preceding 1 September 1839, imported "150 barrels of whiskey, 50 barrels of cider and vinegar, 50 barrels of apples, 7,887 bushels of salt, 1,344 bushels of bulk goods, and 1,105 tons merchandise." Exports included wheat, corn, barley, oats, rye, pork, lard, flour and butter.

By 1839 the Topographical Engineers had an organization and the accumulated experience to effectively improve the harbors at Chicago, St. Joseph and Michigan City as well as to create new harbors at sites on Lake Michigan which had already been surveyed, including Southport (Kenosha), Calumet, Milwaukee, Racine, the mouths of the Manitowoc, Sheboygan, and Keweenaw Rivers and Havre Bay. But the comparatively generous attitude of the Congress and the President toward improvement of lake harbors was changing. The only sum appropriated by Congress between 1838 and 1843 for improvements for navigation in the Lake Michigan area was \$500 appropriated in 1839 toward the eventual building of a pier at the northern end of Lake Winnebago.

The future of the lake ports, from 1840 until the Civil War, would be increasingly affected by intersectional and political contests. A hint at what was to come was contained in the 1840 platform of the Democratic party adopted at Baltimore, Maryland, on 5 May. "Resolved, that the Constitution does not confer upon the general government the power to commence and carry on a general system of internal improvements." This resolution was repeated in each Democratic platform up to the Civil War.

It was not the construction of harbors but the construction of roads which occupied most of Captain Cram's attention in 1839 and 1840. The Engineer Department had been involved in road construction for many years. From 1825 to 1840 Army Engineers made surveys, plans and estimates to extend the Cumberland road or "National Pike" which had been begun at Cumberland, Maryland, in 1811 and would by 1852 reach Vandalia, Illinois. From 1824 until the mid-1830's the Engineer Department was also involved in the construction of 8 roads in what is today the State of Michigan.

The first military road in what is today Wisconsin was begun while this area was still part of Michigan Territory. It was a road from Fort Howard at Green Bay to Fort Winnebago at the Fox-Wisconsin portage and from there to Fort Crawford at Prairie du Chien. The Engineer Department seems to have played no part in beginning the construction of this road.

James D. Doty, who obtained his first impressions of Wisconsin while accompanying Governor Cass on his 1820 expedition to the northwest, became a judge in the early 1820's of a Circuit Court which held sessions at Mackinac Island, Green Bay and Prairie du Chien. After 1824 Doty settled at Green Bay and from that year until 1832 he traveled twice a year to Prairie du Chien to hold court. On 20 January 1829 he and Henry B. Brevoort wrote from Green Bay to Major General Alexander Macomb, Commanding General of the United States Army, enclosing a sketch made by Doty showing the best route for a road from Green Bay to Prairie du Chien. They recommended the road as a means of transporting lead from mines near the Mississippi River to Lake Michigan. Since the prairie offered no obstacle and "wheel carriages can even now pass from the lead mines to . . . Lake Winnebago," only the 38 miles from that place to Green Bay would need improvement, they said. They requested the aid of troops to improve the section from Green Bay to Lake Winnebago. Doty felt "confident that twelve men in one month can open the road." In 1830 Congress appropriated \$2,000 for a road from Green Bay to Fort

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Winnebago, but no action seems to have been taken to construct the road until after Lewis Cass became Secretary of War on 1 August 1831.

On 15 December 1831 the Acting Quartermaster of the U.S. Army, John Garland, wrote to Cass at the request of the Michigan Territorial delegate, Mr. Wing, pointing out that a road between Fort Howard and Fort Crawford "would not only facilitate and expedite the transportation of public stores between these points but would at all seasons ensure a speedy cooperation of the troops in any military movement which might be ordered." In a response to a request from the Secretary of War for his opinion on the matter Brigadier General John E. Wood on 23 December 1831 recommended the road for moving troops and supplies, and considered it preferable to dependence on the Fox-Wisconsin water route which in any event was closed from the middle of November to 1 April, was difficult to navigate in low water and was longer by one-third than the proposed land route which was about 200 miles.

On 4 January 1832 Secretary Cass passed these communications to the Speaker of the House along with his own recommendations to the effect that Fort Howard, Fort Winnebago and Fort Crawford "command the important line of communications between the lakes and the Mississippi." It was "desirable that there should be the means of an easy and more rapid intercourse between them than afforded by the Fox-Wisconsin River." On 31 January, Secretary Cass also forwarded to the House letters signed by 10 officers of the Army stationed at Fort Winnebago who pointed out that winter supplies had not been arriving early enough at Green Bay or Prairie du Chien to be transported up the rivers before they froze over and that the proposed road would not only provide for the movement of military supplies at all times of the year but would provide for "a lively intercourse between the military posts on this northwestern border."

Instead of turning to the Topographical Bureau, Secretary Cass referred the matter of the Fort Howard-Fort Crawford road to the Quartermaster General who appointed Second Lieutenant Alexander J. Center of the 5th Infantry and James D. Doty as commissioners to perform the necessary survey. Although the survey was carried out in the fall of 1832, the report was not submitted to Secretary Cass until 4 February 1835.

The road was to be a somewhat more difficult undertaking than originally conceived by Doty, particularly the route between Fort Howard and Fort Winnebago where "the little traveling has been blindly confined to the old Indian trails, which frequently lead by very

circuitous and unfavorable routes, from point to point visiting in their course villages and other points out of the general course of the line." The commissioners recommended that nothing more be done on the prairies than the running of two parallel plow furrows. The width of the road through the woods was to be 20 feet although a greater width would be better "as the surface of the earth would then be exposed to the (drying) action of the sun."

Work commenced on the road in 1835. Soldiers from the garrisons, employed in labor battalions, completed the 155 miles between Prairie du Chien and the portage between 28 May and 1 August at the cost of \$1,200. There was considerable room left for improvement on this road when, in 1839, responsibility for it was passed on to Captain Cram.

The Topographical Bureau was involved in making surveys for another equally important road during the 1830's. This was a road from Chicago to Green Bay. Appropriations for beginning construction of this road were made in 1838 when \$15,000 was appropriated for a road from Fort Howard to the boundary line of Illinois. At the same time \$10,000 was appropriated for a road from Milwaukee by way of Madison to Dubuque on the Mississippi River and \$5,000 was made available to continue work on the Fort Howard-Fort Crawford road. Lieutenant Colonel James Kearney was sent to Wisconsin late in 1838 to examine the routes and to find contractors to begin the work. This was their status when Captain Cram arrived at Racine in April 1839.

In 1839 appropriations were made for several other roads in Wisconsin Territory. These included \$10,000 for a road from Racine to Sinnipee on the Wisconsin River, \$5,000 for a road from Sauk Harbor, later Port Washington, to Dekorree, and \$5,000 for a road from Fond du Lac to the Wisconsin River. Captain Cram, writing in 1852 concerning his roadbuilding activities in Wisconsin during this period, estimated that there were over 1,100 miles of road involved and "that they were all laid out 4 rods wide and in the woods opened to a width of 2 rods." Except for the road from Fort Crawford to Fort Howard each road received no more than a single appropriation. The Fort Crawford-Fort Howard road and two new roads were to be partially funded in 1845.

By September 1840 Captain Cram had spent the sums appropriated for roads in Wisconsin Territory in 1838 and 1839. The failure of the general government to appropriate additional funds to complete the roads, an estimated \$124,000, may have contributed to a lack of understanding as to how much was actually accomplished.

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For \$15,000 on the route from Green Bay by way of Milwaukee and Racine to the Illinois border, a distance of 155 miles, 132 miles were cleared to a width of two rods and down the center of this clearing a good wagon track 15 feet wide was cut close to the ground so that no stumps would obstruct passing wagon wheels. One hundred and sixteen bridges were built with an aggregate length of 988 feet, all with hewed timber abutments, hewed stringers and spiked-down planks for flooring. There were 9 bridges at the northern end. Otherwise, for lack of bridges, the road north of Milwaukee could not be traveled by wagons. South of Milwaukee to the Illinois border the road was passable for wagons although bridges were still needed over the Menominee, the Root and the Pike Rivers. Captain Cram estimated that \$33,000 would complete the road in a satisfactory manner.

Ten thousand dollars was applied to the first 63 miles of the 150 miles of road from Racine by way of Janesville to Sinnipee in southwestern Wisconsin Territory. Over these 63 miles, from Racine to Janesville, by the fall of 1840 "a team of two horses . . . (could) haul at ease at all times 2 tons." To make this possible trees had been grubbed out through 34 running miles of woods and 151 bridges were built with an aggregate length of 1,966 feet. The average cost of construction was \$159 per mile. Twenty-two thousand dollars was needed to complete this road.

The \$10,000 appropriated for a road from Milwaukee to a point opposite Dubuque on the Mississippi River by way of Madison was expended by the close of 1839 on the 79 miles between Milwaukee and Madison. The road had been cut and cleared, bridges constructed, and causeways placed where needed so that "Wagons with very light loads may reach Madison on the route." A minimum of \$5,000 was needed to complete this stretch of the road, while \$10,000 was needed to build beyond Madison to the Mississippi River.

The only road which could be completed with the sums appropriated was the road from Fond du Lac on Lake Winnebago by way of Fox Lake to the Rock River, a 57-mile course. Here for \$5,000, 20 miles of road was cut through heavy timber. Thirty-two bridges were built, 5 of which were framed trusswork. Twenty-eight bridge abutments were made of stone, the rest of hewed timber. The aggregate length of the bridges was 530 feet. Through stretches of prairie little more was needed than guide stakes to make it possible to find the road in winter storms. The road, Captain Cram wrote in September 1840, is "in excellent condition. No additional appropriation is needed."

The appropriation of \$5,000 for a road from Sauk Harbor to

Dekorree was used largely on the 47 miles west of the Rock River to the Wisconsin River where 5 bridges were built with an aggregate span of 153 feet. The result was a "very superior road for any purpose at all times of the year." The 41 miles between Sauk Harbor and Rock River were heavily timbered. Here a 2-rod wide path was cut which was not passable for teams because of the 30 streams which would have to be bridged. An additional \$11,700 would be needed to complete the road.

A contract made by Lieutenant Colonel Kearney in the fall of 1838 for work on that stretch of the Fort Howard-Fort Crawford road between the southern extremity of Lake Winnebago and Fort Howard used up three-fifths of the 1838 appropriation of \$5,000 before Captain Cram took over the project. Between May 1839 and September 1840 the remaining \$2,000 was used on the same stretch to construct 19 bridges with a combined span of 170 feet and for ditching to carry off surface water in a number of places. The remaining 175 miles of the road to Fort Crawford was, according to Captain Cram, in want of repairs and at places was deteriorating. Thirty-five thousand dollars was needed to put the road in satisfactory condition. An additional \$2,000 was appropriated for the road in 1845 at the time when \$5,000 was appropriated for a road from Southport (Kenosha) to Beloit and \$3,000 for a road from Sheboygan to the Fox River.

Consistent with his assignment as General Superintendent, Captain Cram did not usually refer engineering problems to his superiors in Washington. His training qualified him to make decisions and he did not seem unwilling to do so. This quality led Captain Cram into difficulties in a non-engineering area which during the years 1839 and 1840 could have caused problems for people who were more expert than he.

While in Chicago on 16 September 1839 Captain Cram cashed a Treasury Department draft for \$10,000 at the Chicago Branch of the Bank of Illinois. The Bank of Illinois was, in the summer and the fall of 1839, a Government deposit bank. Its notes were the equivalent of specie. Captain Cram received \$10,000 in Illinois bank notes. He then left Chicago for a circuit of works under his responsibility in Wisconsin Territory to make payment to contractors and others. During the last week of October he was engaged in making a survey of the Rock River near Beloit when he heard that the U.S. Bank of Pennsylvania had been suspended. Fearing the effect on other banks and concerned about the Illinois bank notes still in his hands, Captain Cram broke off his work on the Rock River on 2 November to hasten to Chicago to change the Illinois bank notes into specie. The Bank of

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The Bank of Illinois suspended payment in specie for its bank notes on 23 October 1839 and the value of the notes dropped abruptly. Topographical Engineer Captain Thomas Jefferson Cram had \$10,000 in the notes on hand, all of it public funds for payment to contractors. Should the government, Captain Cram or the contractors take the loss? Captain Cram was court-martialed and acquitted for the way he selected to solve the dilemma.

Illinois, unbeknown to Captain Cram, had suspended specie payment on 23 October. When he arrived at Chicago and applied for redemption of the notes he was refused. By 15 November 1839 notes on the Bank of Illinois were worth 10 to 12 percent less than specie.

Since Captain Cram was responsible for projects originating in a number of appropriations, he had on hand, as well as several thousand dollars in Illinois bank notes, a quantity of other western bank notes, eastern bank notes, and a sum in specie, gold coins such as German thaler and English sovereigns which circulated in the United States during this period. During November 1839 Captain Cram paid off various contractors. In one instance a Mr. Stephan Ives on 20 November 1839 was paid 44 half sovereigns at \$2.50 each, 82 10-thaler pieces valued at \$8.16 each, \$200 in Illinois bank notes, \$119 in eastern notes at par and one-half Eagle for \$5. There were a number of such transactions but the Ives payment proved later to be one of the more troublesome for, though he accepted the payment, Mr. Ives continued to maintain that he had been cheated.

When time permitted in the fall of 1839 Captain Cram carried out a number of surveys which had been directed by Congress. One of these was the Rock River survey on which he was engaged when he heard of the suspension of the Pennsylvania Bank of the United States. The survey was carried out with the view toward improving navigation of the Rock River from the Illinois line to the head of "natural" navigation in Wisconsin Territory.



More ambitious was a continuation of a survey of the Neenah (Fox) and Wisconsin Rivers begun in 1836 by Lieutenants Alexander J. Center and Edwin Rose. Captain Cram's survey was confined to the portage area and to the Fox River. He provided plans and estimates for a series of 8 dams and locks on the Fox River and a 7,739-foot canal at the portage. Locks were to be 110 feet long and 30 feet wide in the chamber. Total estimated cost for the project was \$448,470. When Wisconsin became a State an improvement of this kind was undertaken, but not by the Federal Government.

Other surveys carried out under Captain Cram's direction during this period included a survey for a pier at the northern extremity of Lake Winnebago, a survey for a harbor at the mouth of the Root River near Racine, and a survey for a harbor at the mouth of the Pike River, then Southport, now Kenosha, Wisconsin.

On 30 July 1840 Captain Cram was directed to commence a survey of the boundary between the State of Michigan and the Territory of Wisconsin, an undertaking which for the ruggedness and still untouched beauty of the terrain surveyed could hardly have been much different had it been carried out a century earlier. The survey embraced a part of Green Bay and the Menominee, the Brule, the upper part of the Wisconsin, and the Ontonagon and Montreal Rivers. The operations were "to have in view a correct delineation of the country between the headwaters of the Menominee and the Montreal Rivers so that all the matter requisite to determine a boundary between these two points can be placed before Congress." The survey was begun between the headwaters of the Menominee and the Montreal Rivers where, according to Captain Cram, "that part of the boundary (is located) which may be called imaginary or that is not characterized by natural features." The survey required the better part of 2 summers.

When Congress passed the Wisconsin Enabling Act of 1846 prior to Wisconsin becoming a State in 1848, this part of the Michigan-Wisconsin border followed the line surveyed by Captain Cram. Years later the State of Michigan maintained that Captain Cram had not interpreted the boundary description correctly and had thereby deprived Michigan of some 800 square miles of territory. The controversy reached the Supreme Court which on 1 March 1926 favored Wisconsin's position in part on the ground that Wisconsin had held undisputed possession of the area for so many years. (Holms)

On 3 March 1831, as one of its final acts, the 26th Congress appropriated \$15,000 to commence a survey of the northwestern lakes. The responsibility for beginning the survey in 1841 was divided

N^o 6.



GENERAL MAP

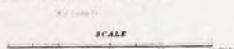
TO ACCOMPANY THE REPORT OF CAPT. T. J. CRAM, T.E.
ON THE SURVEY OF THE BOUNDARY BETWEEN

MICHIGAN AND WISCONSIN

Projected by Capt. Cram.

Drawn by Lieut. Webster.

For method of projection see Appendix to Report.



between Captain William G. Williams, General Superintendent of Harbor Improvements on the southeast shore of Lake Erie, operating out of Buffalo, New York, and Captain Cram, General Superintendent of Harbor Improvements at Lake Michigan. Both men were to begin their portion of the survey in the area of Green Bay. Captain Williams was to begin at the northern extremity of the southern cape of the entrance to Green Bay and also to carry on the survey in the vicinity of Mackinac Island. Captain Cram's portion of the survey began about 7 miles south of the northern extremity of the peninsula near the entrance of Green Bay. It was to extend down the western shore of Lake Michigan to the north pier of the harbor at Chicago.

The survey, as Colonel Abert explained to Secretary of War James N. Porter in 1843, "was to extend over the lakes, as far as practicable, a chain of triangles. . . ." The method, he explained, dated as far back as 1617 when it was applied to the survey of Holland. It had since been approved and was being used in a survey of Great Britain. The lakes, however, presented peculiar problems. "The lakes are extremely broad in places," explained Colonel Abert, "and have nowhere a mountain border capable of commanding very distant views. The idea, therefore, of a primary triangulation, of large triangles, throughout their extent, is one which cannot be sustained; and we are . . . obliged to combine with the primary triangle a series of smaller ones throughout parts of the lake coast." (126)

Captain Williams was able to begin work on the survey early in the summer of 1841. Assisted by a number of junior officers he conducted a reconnaissance of the northern part of Lake Michigan and selected and partially cleared a site for a base line near the entrance to Green Bay. Triangulation stations were erected on Mackinac and St. Martin Islands in Michigan and topographic surveys were made at Mackinac, Round, and Bois Blanc Islands, Michigan, and at St. Ignace, Michigan.

Captain Cram made a general reconnaissance by himself early in the season, but was not able to begin detailed work on his portion of the survey until the first part of September. He had first to complete his Michigan-Wisconsin border survey. In addition, he was handicapped by the absence of 2 junior officers who were "not able for duty." He split his party into 2 groups, one division consisting of himself and 7 men at one extremity, "and the other division of my party consisting of a Lieutenant and 8 men at the other extremity." They remained in the field until 1 November and were able to complete surveys covering 36 miles of the coastline.

Facing page:

During the summers of 1840 and 1841 Captain Cram, assisted by several junior officers including Lieutenant Joseph Webster, carried out a survey of the Michigan-Wisconsin border with particular emphasis on the delineation of the country between the headwaters of the Menominee and the Montreal Rivers.

The first general
superintendent:
Captain T.J. Cram,
1839-1843

On 14 July 1842 responsibility for the survey of the western coast of Lake Michigan along with the funds belonging to it were turned over to Captain Williams and Captain Cram no longer participated in the survey of the northern and northwestern lakes. This was the beginning of the survey of the northern and northwestern lakes as a separate activity, at first with the Topographical Bureau and after 1863 and until 1970 with the U.S. Army Corps of Engineers. In contrast with funding for the improvement of harbors in the pre-Civil War years, after 1841 Congress provided annual funds for the survey of the northwestern lakes, ranging from around \$20,000 in the early 1840's to a pre-war high of \$85,000 in 1859. In 1845 headquarters for survey operations, then under Lieutenant Colonel James Kearney, were moved to Detroit, Michigan.

Developments at Racine, Wisconsin Territory, in the spring of 1842 made it impossible for Captain Cram to carry on with his portion of the survey of the lakes and necessitated the transfer of this responsibility to Captain Williams at Buffalo. Captain Cram was under arrest. In recalling the difficulties of this period at a later date, in 1852, Captain Cram explained, "Some (of the Lieutenants under my command) were then engaged in what appeared the more genial labor of making and prosecuting charges against me."

Thirteen separate charges were brought against Captain Cram growing out of complaints by his fellow officer, Lieutenant Joseph Webster. All of these, except one pertaining to the manner of selling public property, 4 oxen and a wagon, had to do with payments to creditors of the United States with depreciated notes of the Bank of Illinois or in foreign gold coin at a value in excess of their worth.

A court of inquiry which began at Racine around the middle of May 1842 heard testimony and gathered evidence for 31 days. The court adjourned on 20 June after hearing Captain Cram's defense which said in part "When I could do it without oppression or injustice I paid out the Illinois money belonging to the Government in my hands. Where I could not so pay the whole debt I paid part of it so and the rest in specie; when specie for the whole was required I was of course obliged to pay it. The result has been that neither the Government nor any public creditor has been put to loss by the amount of the paper in my hands at the time of suspension of the bank."

Brigadier General G.H. Brooks of the 5th Infantry was President of the court which convened at Racine to try Captain Cram from 9 to 13 August 1842. The results of the trial are told in an extract of a War Department General Order of 30 August 1842 which was published in the *Milwaukee Sentinel* on 14 September:

1. After mature deliberation the court finds the accused Capt. Thomas J. Cram of the U.S. Corps of Topographical Engineers as follows.

NOT GUILTY OF THE CHARGE.

And the court acquits the accused Capt. Thomas J. Cram, of the U.S. Corps of Topographical Engineers of the charge and specifications preferred against him.

2. The proceedings of the court in this foregoing case are approved. Capt. Cram is released from arrest and will report by letter to his Colonel for duty . . .

Captain Cram's difficulties emphasize one of the hazards of being responsible for public funds, particularly in time of unstable and uncertain currency. An independent study of the Corps of Topographical Engineers by David Garry Ryan in 1968 had this to say about Captain Cram's trial. "In all the Corps History Cram was the only topographical engineer tried for the mishandling of public money, a truly remarkable record considering the amount of money the Topographical Engineers handled, the temptations presented by an acquisitive society, and the meager salary they received."

With the trial over Captain Cram could return to his duties as general superintendent of harbor works on Lake Michigan. His 1842 annual report of 14 October presents a dreary picture of the Lake Michigan harbors. No funds had been provided since 1838. At Chicago, "The timber of the works above water and between 'wind and water' have commenced the process of decay, so as to show rot in many places. The property is as secure as possible to render it, but of course is under rapid deterioration." The main problem at Chicago was the accumulation of sand at the harbor entrance and between the piers. "The citizens contributed about \$1,200 last summer for the purpose of dredging the channel. Since that was accomplished less difficulty has been felt."

At Michigan City the water between the piers was only sufficient to float a scow and vessels could not come closer to the harbor than several hundred yards. The timber of the piers had not yet begun to decay, and the Government dredge moored in a creek there was in as good a condition as might be expected, considering 3 years' exposure to the weather.

At St. Joseph sand was blowing over and through broken sections of the north pier and collecting in the channel. "In 1839, there was a depth of water to allow vessels of the largest class . . . to come alongside the pier where there is now not more than one foot of water." No

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sums were remaining for these projects and \$42,000 was the smallest sum needed simply to preserve the works.

Beginning in 1840 shipping interests put increasing pressure on Congress to appropriate funds for lake harbors. Lake Michigan in particular was subject to storms which made it exceedingly dangerous in view of its lack of harbors. Storms and the resultant loss of property and life claimed the increasing attention of those involved in lake commerce. On 9 May 1840, a Mr. E. Starr of Milwaukee wrote the Wisconsin Territorial delegate to the U.S. House of Representatives, "There has been property enough lost within the last ten days on Lake Michigan, to have built three good harbors. The steamboat Champlain, the brig Queen Charlette, and four or five schooners, are ashore, and some of them total wrecks, and what a pity it is that they were not all loaded with Senators and members of Congress. We all have strong hopes that an appropriation for a harbor will be had." (246-6)

In 1841 Captain Thomas Jefferson Cram reported from Lake Michigan that in the foregoing half dozen years 110 people had lost their lives in shipping accidents, 90 vessels had been lost, and over \$1 million had been suffered in property damage. "The causes of so much destruction of life and property," wrote Captain Cram, "are—natural storms, defects of machinery, want of harbors, want of seamanship, and want of knowledge of the coast." The last cause would be remedied, he anticipated, by the survey which had been commenced. But the effects of storms, to which he attributed the majority of disasters, could only be offset by improving harbors.

Perhaps the most stark description of a ship disaster on the lakes in 1842 concerned the loss of the "Milwaukee" which appeared in the *Chicago Express*. "On leaving Chicago, the ship proceeded to St. Joseph where she took on board some 3,000 barrels of flour, and then proceeded to the mouth of the Kalamazoo. She had just finished loading when the gale came on. The captain attempted to ride it out, but without success. . . . A perfect hurricane was blowing at the time, accompanied with snow. The crew consisted of fourteen or fifteen persons; of these six or seven only were saved. All who perished were frozen to death, with the exception of one who was drowned. The captain died first. The chief mate was frozen to death while standing at the wheel."

Testimonials describing the insecurity of lake commerce were frequently sent to Congress during this period. A letter from E.B. Ward, Master of the mail steamer "Huron," plying daily between Chicago and St. Joseph to William Woodbridge, United States Senator from Michigan, is typical:

Washington, December 26, 1842.

Sir: The frequent distressing shipwrecks on Lake Michigan induce me to address you in behalf of our suffering commerce, which is rapidly increasing, but, for want of a few good harbors on that lake, is greatly crippled by immense loss of lives and property.

The losses on that lake during a single month of this year exceed \$40,000 and nine lives, a large proportion of which would have been saved had there been safe harbors for loaded vessels to resort to during stormy weather.

The improvement of three harbors on that lake is indispensably necessary for the protection of our commerce, to wit, Chicago, St. Joseph, and Milwaukie; beacon lights should be placed upon the piers at Chicago and St. Joseph.

The improvement of these harbors would save annually an amount of property nearly if not quite equal to the cost of the necessary works, beside the immense benefits that would accrue to the great agricultural interests in the several States bordering on those inland seas.

During the past year I have witnessed the stranding of several fine vessels at the entrance of the harbors of St. Joseph and Chicago, for want of a sufficient depth of water on the bar. Two of the finest boats on the lakes were much damaged, and for some time in imminent danger of total loss from the same cause.

Two schooners and one steamboat have been stranded for want of beacons on the piers.

The arrivals and departures of steamboats at Chicago the past year are upward of 480, and at St. Joseph 260, beside a great number of ships, brigs, and schooners, arriving and departing daily, freighted with the agricultural products of the most fertile portion of the United States.

There are engaged upon the northern lakes upward of 300 sailing vessels, and 50 steamboats, many of which are equal if not superior in size and splendor to our finest coasting vessels, employing over 4,000 men in their navigation.

I have the honor to be your obedient servant,

E. B. WARD,

Master of steamer Huron.

Wm. Woodbridge, Senator from Michigan.

The first general
superintendent:
Captain T.J. Cram,
1839-1843

On 28 February 1843 a Senate Committee on Commerce claimed for waterborne commerce on the Great Lakes "the same degree of protection" as is warranted by the Constitution to commerce on the Atlantic Seaboard. "The Constitution," argued the committee, "assuredly was not limited to the Atlantic, nor made for the south and east alone." Along with the power to regulate commerce delegated to Congress there was, the committee asserted, the "correlative duty of encouraging, building up, protecting that commerce."

Specifically, the committee noted "The protection asked for . . . comprises the object of deepening, straightening, and securing the ship channel through what is called the 'St. Clair Flat' . . . completing the public works long ago commenced at La Plaisance Bay and the River Raisin . . . continuing and perfecting the public works on the coast of Lake Michigan at Chicago, Illinois, St. Joseph in Michigan and Michigan City in Indiana and also constructing new and appropriate works . . . at Milwaukee . . . and other points on the coast of the same lake."

Although there were no general appropriations for rivers and harbors in 1841 or 1842, before the 27th Congress adjourned in 1843 it appropriated \$75,000 for work on Lake Michigan. Twenty-five thousand dollars was for construction of a harbor at a suitable place near Milwaukee in the territory of Wisconsin. Before the money was to be expended, "The Corps of Topographical Engineers shall select from actual examination and survey the point of location of said harbor" (laws, etc. 82). Twenty-five thousand dollars was appropriated for continuation of work on the Chicago Harbor and the same amount for the harbor at St. Joseph.

The appropriation early in 1843 of \$25,000 for the construction of a harbor at Milwaukee led to a disagreement between Captain Cram and some Milwaukee citizens about the location of the harbor entrance. The village wanted a new outlet cut for the harbor through a sand bank north of the natural mouth of the river—not unlike what had been done earlier at Chicago. Their preference was based in part on a survey of the harbor by Lieutenants Alexander Center and Edwin Rose in 1836. Captain Cram apparently favored improving the mouth of the river. The status of this disagreement as of 12 April 1843 is reflected in this quotation from an article in the *Milwaukee Sentinel* of that date. "Harbor at Milwaukee.—There has been considerable excitement in town for the past few days among the citizens on the account of the rumors afloat respecting the location of the harbor." Captain Cram told townspeople that "the location will probably be (made) by two or three of the oldest engineers in the Bureau at



Washington." The newspaper was not sure what to believe but expressed the opinion that "Whoever locates the Harbor will be sure to put it in the *best spot* for the protection of Commerce if they have any regard for their reputation."

Before the matter could be settled Captain Cram received orders transferring him to St. Louis. The *Milwaukee Sentinel* did not comment but reprinted (on 10 May 1843) an article from the *Racine Advocate* describing this development. "Capt. T.J. Cram we regret to state, has been recalled from this place. . . . Last Monday evening our citizens met and received the Engineer's report of the condition of the works. . . . Our citizens gave Captain Cram their most cordial and heartfelt thanks for the many benefits which they have received at his hands. He will long be remembered as the amiable citizen and public benefactor. Capt. McClellan, we understand has been ordered to take charge of the public works on this side of Lake Michigan. . . ."

On 28 May Captain J.M. McClellan, Captain W. Williams, and Lieutenant Colonel James Kearney met in Milwaukee as a board

Congress appropriated money for construction of a harbor at Milwaukee but left selection of the location to the Corps of Topographical Engineers. The Milwaukee townspeople favored the "straight cut" recommended in 1836 by Lieutenants Center and Rose. An engineering board decided in May to improve the mouth of the river since the harbor opened by the "straight cut" would have been more shallow.

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organized for determining the location of the harbor improvement there. Having examined the harbor and river themselves they determined that the maps of the locality prepared by Lieutenants Rose and Center in 1836 no longer described the actual harbor conditions. Placing the proposed piers at the northern site and opening a new outlet to the lake at this point would jeopardize the deeper harbor inside the natural mouth of the river farther south. They recommended against putting the pier where local interests suggested since such an improvement "would have made the harbor merely an entrance for second class steamers . . . a mere local affair."

During his 4 busy years as General Superintendent for harbor works on Lake Michigan, Colonel Cram was remarkably productive. Through his efforts Wisconsin obtained some of its earliest roads, and his plans for improving the Fox and Wisconsin Rivers were of use to the State when it embarked on that project. He was not able to accomplish more toward improvement of harbors on Lake Michigan due to the unresolved question as to what the Federal role should be in these matters. This issue was about to become entangled with others which soon divided the Nation into two camps, one strongly in favor of Federal participation in lake harbor improvements, the other strongly opposed.

Chapter 5

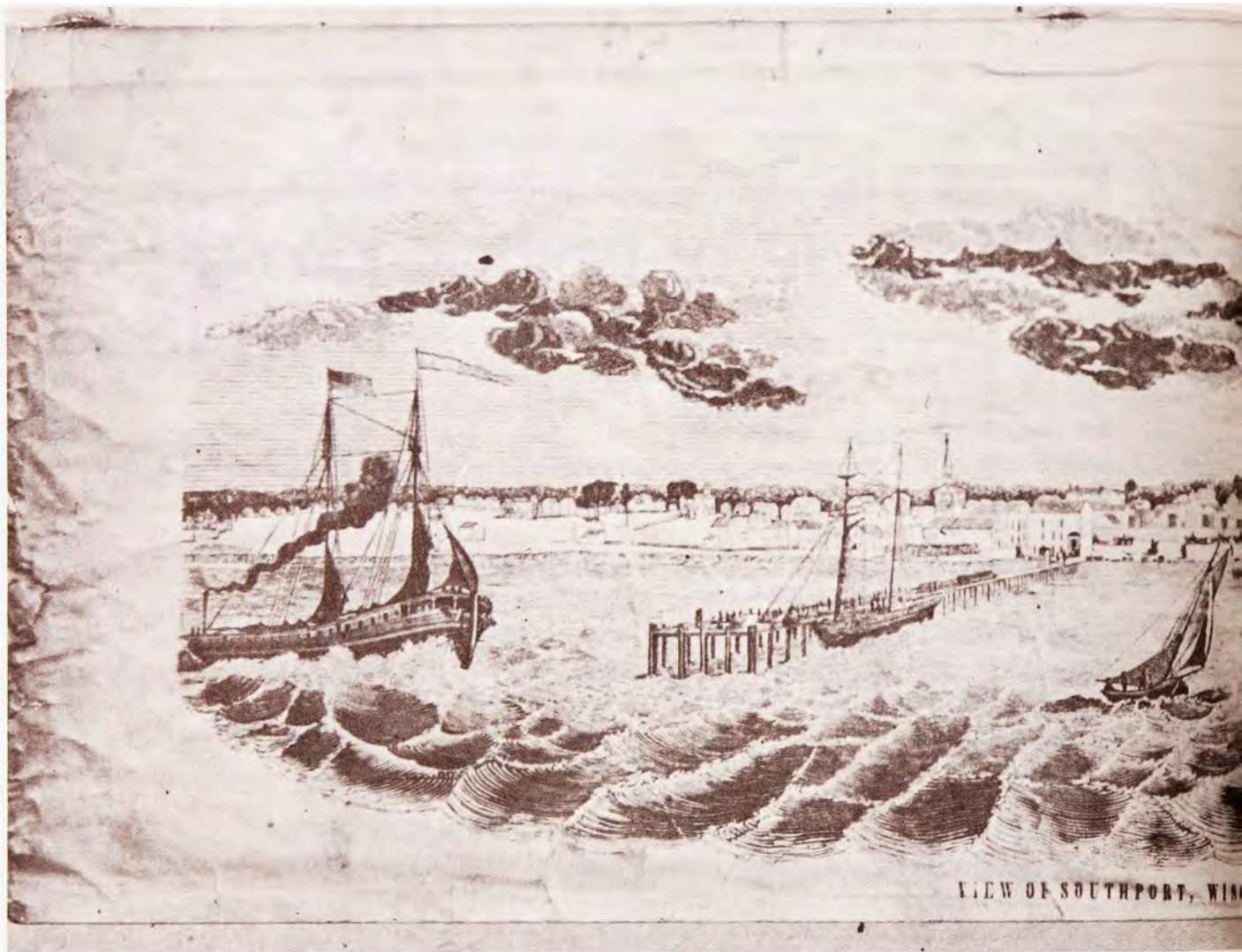


A decade of halting progress, 1843-1853

Early in 1843 the Corps of Topographical Engineers made Captain John McClellan General Superintendent of Public Works on the west side of Lake Michigan. An 1822 graduate of West Point, Captain McClellan, after 14 years of military service, had resigned his commission in 1836 and for 2 years worked as a civil engineer. In July 1838 he was reappointed to the Army with the rank of Captain with the Corps of Topographical Engineers. Captain McClellan established the Office of General Superintendent for Harbors on the western side of Lake Michigan at Chicago where he stayed until the close of the 1846 navigation season when he was reassigned to participate in the war with Mexico.

The special appropriations of 1843 for Chicago, St. Joseph and Milwaukee Harbors on Lake Michigan were followed in 1844 by a harbors bill of 11 June passed by the 27th Congress over the veto of President John Tyler. The 1844 bill provided additional funds of \$30,000 for Chicago and \$20,000 each for the harbors at St. Joseph and Milwaukee. In addition, in 1844, Michigan City received \$25,000 and 2 new harbors, Southport and Racine, each were funded for \$12,500. Southport received an additional \$15,000 in 1845. No more funds were appropriated for lake harbors for nearly a decade.

While General Superintendent of Public Works at Chicago, Captain McClellan had under his supervision a United States agent at each of the harbors under construction who was responsible for the day-to-day activities. This was true also at Chicago where Mr. Charles Schlatter was in charge of the office of Public Works there. In other



VIEW OF SOUTHPORT, WIND

respects, unlike the early years of the work on the Chicago Harbor, the prerequisites of labor and materials and their costs, though there were local variations, were routinized and somewhat predictable. A typical operation might include a foreman at \$2 a day, 4 carpenters at \$1.25 a day each, a blacksmith at \$1.50 and a "blower and striker," a blacksmith's assistant, at \$16 a month. In addition, the project might include 10 laborers each receiving \$16 a month. The men would receive rations at 18 cents a meal and the cook would receive \$25 a month. Four horses would be needed which would cost from \$65 to \$75 each. It would cost \$320 to feed 4 horses for 15



months. Each operation needed buildings, a mess house, an office, a barn or stable, and a blacksmith shop. Each would use pile drivers, crane scows, boats, ropes and blocks, etc. Not all projects had their own dredges. This expensive piece of equipment could be moved from one harbor to another though it was not a simple operation for the dredges were not self-propelling. Since each harbor project involved building similar parallel piers constructed of cribs into the lake, each required an amount of pine and oak timber, oak ties and planks, spikes and bolts to hold the piers together, and large quantities of stone to hold them in place.

Before Federal funds were appropriated to begin work on the harbor at Southport (Kenosha), in 1844, communities and private interests built wharves into the lakes so vessels might load or unload without transferring goods to smaller boats.

The Chicago Harbor—1843—1846

An advantage of the periodic change in supervising officers was the freedom with which a new officer might view the accomplishments of his predecessor. In 1839 a change had been made in the direction of the north pier at Chicago which originally ran in a general west-east direction but slightly to the south. In 1839 an extension was made at an angle to the north. The object was to deflect sand which was accumulating at the mouth of the harbor. Captain McClellan reported to Colonel Abert on 14 July 1843 that he doubted the propriety of continuing the construction of the north pier in its present direction. The 1839 change in direction exposed the entrance to the harbor, he said, to the northeast wind and had the effect, by throwing water back upon the lakeshore north of it, of causing the shore to "travel out along . . . (the pier) rapidly. . . . Had operations on the work ceased for a few years longer, the shore would have reached and passed around the head of the pier and joined the bar at the entrance of the harbor."

In observing the sandbars which formed at the entrance to the harbor Captain McClellan noted that this sand had been collected by the lake water in its passage along the shore of the lake and, by a combination of forces which had created the configuration of the original mouth of the river, continued to deposit sand there. "It would appear that the efforts of nature are to force the channel back into its original direction and to empty into the lake south of the piers as it originally did, and it is well calculated to raise a doubt of the propriety of locating the piers at any other point than at the mouth of the river by which course we make an opponent instead of an auxiliary of nature."

Captain McClellan did not seriously recommend relocating the harbor entrance. He had alternative suggestions for stopping the sand from collecting there. He was convinced that "by building another pier at a proper distance north of the north pier the entrance to the harbor would be rendered permanent." Since no sand accumulated below the south pier, it seemed reasonable to Captain McClellan that a new pier placed at a distance from the north pier greater than the length of the sandbar which had been built up would solve the problem permanently. "The shore north of the north pier would have the same relation to the new pier that the south shore of the south pier has to it and there no change takes place."

As reasonable as this plan may have been, it was too costly to have been taken seriously in Washington. This was a time when

the attention of the department to the subject
 it would confer a great favor on us who are most
 interested as the appropriation at present unexpended
 might go in the place where it would do the
 most good. I could obtain a number of names
 who would sustain me in the present observation
 I remain Sir
 your obt. Servt

John M. Turner

Lake Michigan



Topographical Engineer
 Captain John McClellan,
 General Superintendent
 of Public Works on the
 west side of Lake Michi-
 gan from 1843 to 1846,
 believed that the
 problem of sand
 accumulating across the
 entrance to the Chicago
 Harbor could be elimi-
 nated by building a third
 pier parallel to and
 some distance north of
 the north pier. His idea
 was shared by Captain
 John M. Turner, a veteran
 of 35 years of sailing,
 17 of which had been
 spent on the Lakes. Cap-
 tain Turner made this
 sketch of the Chicago
 Harbor in 1854. The pro-
 posed pier is shown at the
 far left.

appropriations were difficult to come by. Captain McClellan's third suggestion proved acceptable and for a time, at least, effective. "A circular pier ... is the only kind which can be substituted ... (at the end of the north pier) without losing the use of the part of the north pier constructed since the direction was changed. ..." The object was to bring the pier back to the line of its original direction so "that it might have the form which would cause the water flow from its surface in a direction and with a force sufficient to cause the bar, should it form again, to form sufficiently far from the entrance to allow passage between it and the head of the north pier." The form of a half circle or curve was adopted. The outer extremity of the north pier was lengthened in 1844 with 475 feet of cribs which were placed in a curve ending on the original line of the pre-1839 pier.

In the fall of 1844 Captain McClellan was able to report that "This (change) has had the desired effect, the shore has ceased to travel out, the water near the head of the pier has preserved its depth." "The north pier," McClellan wrote to Colonel Abert, "now serves as an effectual breakwater, and frequently vessels entering the harbor for shelter in heavy northeast gales pass a short distance inside the head of the pier, and lay alongside of it in still water through the gale."

Early in 1845 Captain McClellan added a beacon light to the end of the north pier which was "of inestimable value to vessels entering the harbor in storms at night . . . the lighthouse on land being so far from the end of the pier (3,000') as to be of no service to them in finding the entrance."

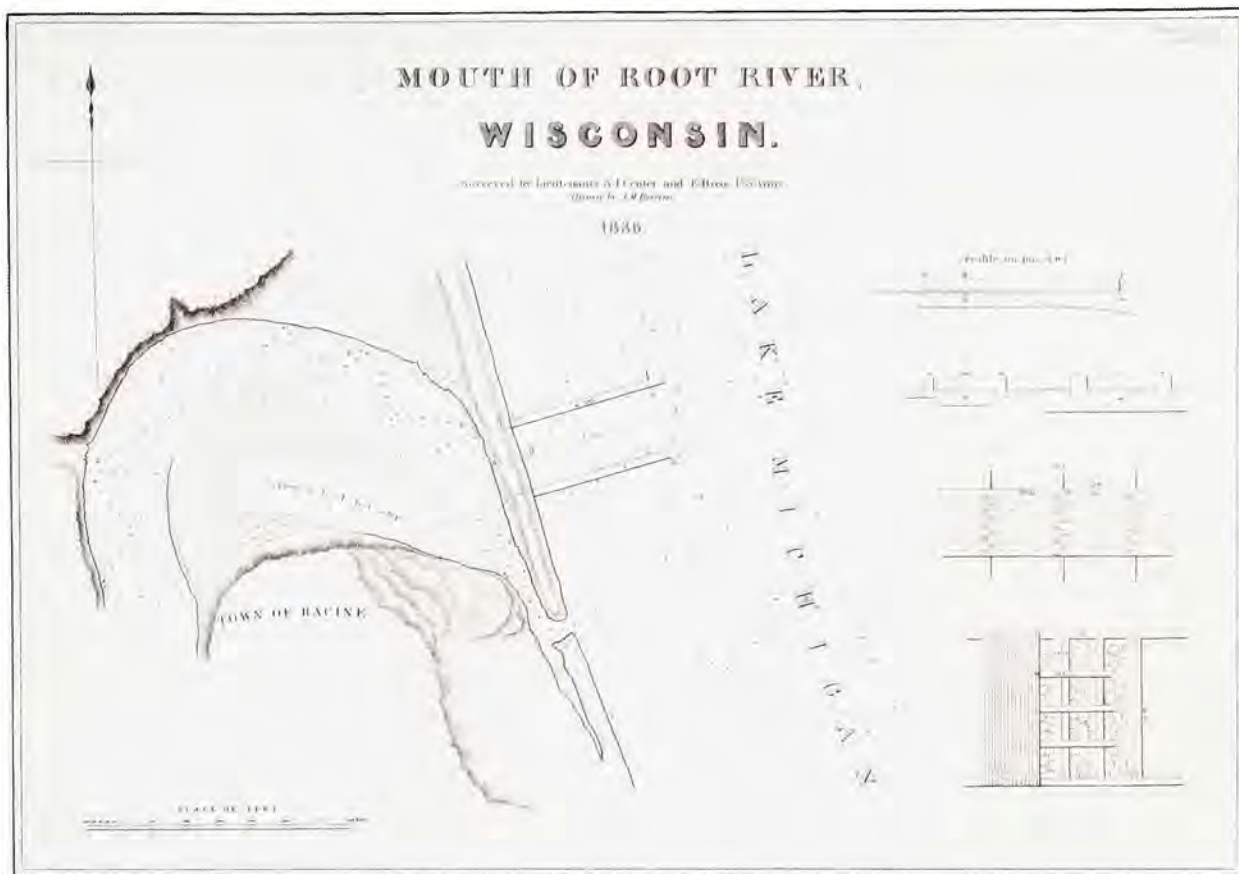
Nearer to shore on the north side of the north pier sand had banked up against the structure until it had reached the top and had commenced passing over the pier into the river. In 1843 Captain McClellan had a fence built north of and parallel to the pier to control the action of the sand and wind. He also experimented in planting grass on the sand to stabilize it. The fence proved effective and in 1845 a second fence 1,010 feet long was built from the lakeshore inland.

From 1843 to 1846, funds were applied at Chicago to leveling, decking and repairing the piers. In addition, almost constant use was made of the dredge, when it was not down for repair or on loan to other harbors, with the result that a greater part of the 200-foot space between the piers was excavated to a depth of 12 feet. At the end of 1846 Chicago could claim one of the best and safest harbor entrances on the lakes.

Michigan City and Other Harbors

With the funds appropriated in 1844 for the harbor at Michigan City a channel 7 feet deep was established between parallel piers 100 feet apart. Like most harbors on Lake Michigan the entrance to the harbor was subject to blockage by sandbars. To eliminate these sandbars, rather than continuing to extend the piers, it was proposed that a breakwater be constructed which would not only retard the formation of the sandbars but would afford shelter to vessels during storms. The 100-foot width between the piers was not sufficient to allow safe entrance of vessels into the harbor during boisterous weather.

Appropriations in 1843 and 1844 were sufficient to construct a harbor at the southern outlet of Pike Creek, adjacent to the town of



Southport some 56 miles north of Chicago, which could be entered by the smaller class of vessels operating on the lake. Difficulty was experienced maintaining a channel 6 feet deep and 75 feet wide into the harbor because of accumulating sand.

Ten miles north of Southport at Racine the local citizens, after the 1844 appropriation had been exhausted, collected \$5,000 in 1845 to continue work on the harbor. With the help of these funds a harbor entrance with 9½ feet of depth was achieved by 1846.

Thirty miles north of Racine, at Milwaukee, works had been constructed by 1845 which provided an entrance to the harbor of 11-foot depth. This exhausted the appropriations of 1843 and 1844. In 1846 further work was made possible by the lending of Government machinery to the town.

Chicago, Southport, Racine, and Milwaukee were the only harbors on the western shore of Lake Michigan which had been improved by 1846. From Milwaukee to the entrance of Green Bay, about 150 miles, there were no man-made harbors although 2

This survey and plan for improvement of the mouth of the Root River at Racine, Wisconsin, was made in 1836 by Lieutenants A. J. Center and E. Rose. Federal funds were not appropriated for harbor improvement at Racine until 1844. Between 1843 and 1851 the people of Racine raised \$43,000 to improve their harbor.

A decade of halting
progress, 1843-1853

locations recommended themselves for improvement. These were Sheboygan, 50 miles north of Milwaukee where a natural harbor could be reached over a bar with 4 feet of water, and Manitowoc, 25 miles north of Sheboygan with 5 feet of water over a bar. Both localities offered deep and capacious harbors after passing over the obstructing sandbars.

By 1846 just over \$604,000 had been spent on improving harbors on Lake Michigan; still those involved in the lake commerce, and many only indirectly affected but who lived in the States bordering the lakes, felt the Federal Government was not providing the protection and support which the rapidly growing commerce on the lakes deserved.

In 1842 a systematic effort had been made by the Topographical Engineers to obtain information on the value of lake commerce. U.S. Customhouses were enlisted in this effort to show the kinds and quantities of commerce for the years 1835 to 1842. Some information, notably from Chicago, was not available; nevertheless, it was found that the value of the export trade on the lakes had grown 16 times greater from 1835 to 1842, or from \$2 million to \$32 million. The import trade, valued at \$14 million in 1835, rose to \$33 million in 1841.

The increase continued throughout the decade. According to James L. Barton, a Buffalo grain dealer, in 1835, 98,071 bushels of wheat from Ohio, practically the only State exporting grain at the time, passed through Buffalo on the Erie Canal en route to the



seaboard. Ten years later, in 1845, well over a million bushels of wheat from the western lakes States were exported over that same route to the New York market.

The size of lake vessels increased to handle the growing trade. "The actual number of steamboats now on the lakes compared with 1841 is not much if any increased," wrote Barton in 1846, "but those which have gone off have been replaced by others of double and quadruple in capacity. At that day (1841) there was but one boat over 700 tons, and one other above 600 tons burden. The new ones range from 600 to 1200 tons."

Of the trade with Chicago, Barton wrote, "At that time (1841) the business from Buffalo to Chicago could be done by six or eight of the then largest size boats; now it requires 15 of more than double the capacity, to do it, aided by about 20 steam propellers of more than 300 tons each and an almost endless number of large brigs and schooners, many of which can carry 10 to 15,000 bushels of wheat." Colonel Abert, in 1847, after reviewing all aspects of the trade on the lakes, concluded that a 17-percent annual increase in commerce had occurred between 1841 and 1846.

In other respects as well the phenomenal growth of the Old Northwest which had begun in the 1830's continued throughout the following decade. The old Northwest became the fastest growing section in the country. From 1840 to 1850 its population increased nearly 60 percent. The populations of Michigan and Wisconsin



The only harbors which had been improved on Lake Michigan by 1846 were Chicago, Southport, Racine, and Milwaukee. North of Milwaukee, Manitowoc and Sheboygan had capacious harbors but their entrances were blocked by sandbars. Sheboygan inspired this view in the early 1840's.

expanded at extraordinary speed. Michigan doubled its number of inhabitants while the population of Wisconsin increased ninefold. Detroit grew from just over 9,000 in 1840 to 21,000 in 1850. Milwaukee expanded from 1,750 to 20,000 in the same period.

Such growth inevitably added to the political strength of the Old Northwest but the country at large was slow to recognize the demands of this rapidly growing region. In part, lack of appropriations for improvements for navigation on the Great Lakes was due to the drain on Federal funds occasioned by the war with Mexico which was declared in May 1846 and ended in February 1847. It was also due to President James Knox Polk's and the Democratic party's position in regard to internal improvements. The platform adopted by the Democratic convention in Baltimore, 2 days before it nominated Polk as candidate for President, on 29 May 1844, included the resolution that "the Constitution does not confer upon the general government the power to commence and carry on a general system of internal improvements."

Various Democrats interpreted this resolution in ways which fit requirements of their constituents, but Polk vetoed appropriations for general harbor improvements in 1846 and again in 1847. The President's veto and his contention that many of the proposed river and harbor improvements were unconstitutional led to an outburst of indignation in the Old Northwest which was strongly echoed by commercial interests of the northeastern Atlantic seaboard. The spirit of protest found expression in the Northwestern River and Harbor Convention, Chicago, 5-7 July 1847.

New York, Pennsylvania, Ohio, Michigan, Indiana, Wisconsin and Illinois sent large contingents of delegates. But New England, New Jersey, Iowa, Missouri, and even Georgia were also represented. The New York delegation alone is estimated to have numbered 300. These, along with others from the East, came to Chicago by lake steamer. The Whig journalist, Thurlow Weed, who sent reports of his voyage west to the *Albany Evening Journal*, traveled aboard the 1,200-ton steam vessel, the "Empire."

There had been many changes in lake navigation since the first steam vessel crossed Lake Erie in 1818. The "Empire" was three times the size of "Walk-in-the-Water." Whereas "Walk-in-the-Water" had to anchor outside the shallow entrance to the Buffalo Harbor, Army Engineers had since provided for an entrance of sufficient depth. But the Buffalo Harbor was still difficult to enter during a storm and was far too small to accommodate Buffalo's immense commerce, the value of which, in 1846, was estimated to total nearly \$50 million.

Thurlow Weed had hardly boarded the "Empire" on 30 June 1847 when the vessel's captain "commenced working his way, by slow and tortuous movements, out of Buffalo Harbor, the insufficiency of which, for the vast commerce of these inland oceans, forcibly impressed us with the importance of the convention about to assemble at Chicago."

Six hundred cords of wood, the harvest from 10 well-wooded acres, were consumed by the "Empire" in a round trip from Buffalo to Chicago. Occasional stops had to be made to replenish her fuel supply. At such times steerage passengers joined with deck hands in hauling the cord wood on board.

Before passing from Lake Huron into Lake Michigan the "Empire" put in at Mackinac Island's little harbor "to replenish our larder with an abundance of salmon-trout and whitefish." Lake Michigan displayed nothing of its violent nature. Nights were calm and beautiful, days were bright with "blue sky above and blue waters beneath us."

This was the first trip west for many of the eastern delegates and the journey as well as the convention in Chicago helped to strengthen ties between people of the North Atlantic seaboard and those living on the shore of the western lakes. Easterners who could not make the trip could read comments such as the 4th of July sentiments of Weed which appeared in the *Albany Evening Journal*.

The great and good men who, seventy years ago, carved out a republic, could have had but imperfect conceptions of its even yet unappreciated magnitude. They did not dream that in territory then unknown to them, there would now be a population greater than that of the old thirteen colonies. They could not, in their wildest imaginings, have supposed that on these then unexplored Lakes there would now be a commerce exceeding, in tonnage and value, that of our Atlantic States. Yet these things are more than realized. And in reference to the population and resources of the West, we have only seen "the beginning of the end."

On the evening of 4 July the "Empire" reached Chicago, then a town of not more than 16,000 inhabitants and hard pressed to provide accommodations for the 10,000 delegates who attended the convention. Many slept and ate aboard the vessels that had brought them to the city.

Fourth of July festivities had been delayed a day to coincide with the opening of the convention. A tent pavilion which could seat 4,000 delegates was erected on a public square near the center of the city. Several thousand more people looked over the heads of seated



delegates to catch glimpses of celebrities and hear the opening remarks, all of which attacked President Polk's strict interpretation of the Constitution and his veto of river and harbor appropriations.

Many then well-known personalities participated in the 3-day proceedings. Thomas Corwin of Ohio delivered the keynote address. Corwin's remarks reported in the *New York Semi Weekly Tribune* by Horace Greeley, himself a delegate, pointed to the "wants and just demands" of the West and spoke of the "absurd folly of considering Harbor improvements on salt water constitutional and on fresh water not so."

One speaker, though little known at the time, is still well remembered. "Abraham Lincoln, a tall specimen of an Illinoisian, just elected to Congress from the only Whig district in the State, was called out, and spoke briefly and happily in reply to Mr. Field," the only person at the



convention who defended the strict interpretation of the Constitution adhered to by the Polk administration.

The major work of the convention consisted of formulating 15 statements of principle. In summary, these principles asserted that since Congress had the constitutional right to regulate and tax commerce it also had the obligation to support commerce by providing "all those facilities and that protection which the states individually would have afforded, had the revenue and authority been left there." Foreign commerce and internal trade were inseparable and deserving of the same considerations. The conferees agreed that "The inequitable distribution of appropriations for interior rivers and lakes as compared to Atlantic ports and rivers should be corrected."

The fifteenth principle disavowed "any attempt to attach the cause of internal trade to the fortunes of any political party." Though

Chicago's population in 1845 was 12,088; by 1855 it was over 82,000. Topographical Engineer Lieutenant Colonel J.D. Graham wrote in his annual report, "The population of this city is increasing, perhaps, in as rapid a ratio as that of any city of the world; and it will probably go on at about the same rate until it reaches several hundred thousand."

Whigs were prominent among the convention officials a nonpartisan tone was maintained. Presumably Democratic elements present, though dissatisfied with the anti-internal improvement stance of the Democratic administration, were not yet prepared to leave their party.

The issue of internal improvements continued to generate heated debate for the rest of the decade but no funds were appropriated and such harbor improvements as were carried out were the result of State efforts, in the case of the harbor at Buffalo, or the result of local initiative. All federally sponsored lake harbor projects became inactive.

The opening in 1848 of the Illinois and Michigan Canal provided direct trade possibilities between Chicago on Lake Michigan and the Mississippi River and furthered extensive commerce on the lakes. The canal was 96½ miles long, 60 feet wide at the water surface, and 6 feet deep. It had 17 locks each of which was 110 feet long and 18 feet wide.

The canal reached from 5 miles from the mouth of the Chicago River at the Chicago Harbor to La Salle on the Illinois River. From La Salle it was 213 river miles to the Mississippi River. The Illinois River was navigable for flat boats at any time when it was not frozen over. It could be navigated by steamboats during months of highest water, about 4 months of the year. In addition to the main canal branch connections were made, one with the Calumet River at a point about 6 miles from where the river flowed into the lake. Although the entrance to the Calumet River from the lake was not improved, the incentive to do so was greatly increased since, once over the bar which closed the entrance, a depth of 10 feet of water could be had on the Calumet River all the way to the point of juncture with the canal feeder to the Illinois-Michigan Canal. A second feeder canal was made, 5 miles long, connecting the Illinois-Michigan Canal with the Kankakee River which opened the Illinois-Michigan Canal to a large area of Indiana through which the Kankakee River passes. The feeder canals were 40 feet wide and 4 feet deep.

The region served by the canal soon began to receive its merchandise from the lake port and to send its wheat and other surplus farm products to Chicago for shipment East. In addition, many steamers from the Upper Mississippi River descended to the mouth of the Illinois River and went up that route with cargos to be forwarded to New York via Chicago. Within 6 years the Rock Island Railroad was running along the entire route of the canal from Chicago to the Mississippi River. Although the railroad absorbed much of the business the

canal continued to play its role in the economic growth of Chicago and in the increased commerce of the lakes.

In the fall of 1849 Topographical Engineer First Lieutenant Joseph Dana Webster arrived at Chicago to oversee the construction of a Marine Hospital on the grounds of old Fort Dearborn, the construction of a lighthouse at the end of the north pier at Chicago, and of a second lighthouse some miles to the south at the mouth of the Calumet River. Although the Federal Government had not carried out harbor projects for some time Lieutenant Webster also exercised a kind of general superintendency over harbors on the west side of Lake Michigan. The last general appropriation for lake harbors had been made in 1843.

Lieutenant Webster, who had been born in Old Hampton, New Hampshire, in 1811, was more mature than his rank might indicate. He had graduated from Dartmouth College in 1832, and then practiced law in Newbury, Massachusetts, for some time before becoming a clerk in the Engineer Department of the War Office in Washington. He was made a civil engineer in 1835 and was appointed Second Lieutenant to the Topographical Engineer Corps in July 1838. He arrived at Chicago fresh from the Mexican War and had been promoted to First Lieutenant only a few months before. On arriving at Chicago he found a Mr. William Gamble in charge of the property belonging to the now inactive harbor project there.

The Marine Hospital at Chicago was constructed for the Treasury Department. It was completed and turned over to the Collector of the Port at Chicago on 15 March 1852. The lighthouse at the mouth of the Calumet River was nearing completion late in 1851 and presumably was turned over to the Treasury Department also in 1852. Lieutenant Webster was well pleased with the design he had chosen for the lighthouse at the mouth of the Calumet River. Instead of being round this lighthouse was square and combined the dwelling house of the keeper with the tower, a convenient and picturesque combination if we are to believe Lieutenant Webster. The lighthouse at the end of the north pier at Chicago was not completed by Lieutenant Webster although he placed a crib foundation and was ready to begin on the superstructure in September 1851. Lack of funds and final approval of a plan by the lighthouse board held up this project.

It was not these projects which captured the imagination of Lieutenant Webster. He was greatly concerned for the harbor at Chicago. Very soon after his arrival, on 7 September 1849, he had observed the sand which was creeping around the outer end of the north pier and threatening to close the harbor. At this time he agreed

The first lighthouse at Chicago was built in the early 1830's adjacent to Fort Dearborn. Twenty years later its light was obscured by the city growing up around it. A new lighthouse was built at the harbor entrance in 1859. The vessel shown just left of center appears to be a dredge but positive identification remains uncertain.



with his predecessor in favoring an auxiliary pier 2,000 feet north of the north pier and in very similar language to Captain McClellan recommended to Colonel Abert in Washington that a way must be found to harness the forces of nature rather than fight them. He admitted philosophically that perhaps no solution would be found by which to control the sand, in which case "our work will never be done."

By 9 April 1850, however, he was convinced that a breakwater or, as it was also called, a "jetty pier" constructed at some distance to the northeast of the end of the north pier would result in concentrating the force of the prevailing flow of water through the opening between the 2 structures with the result that the sand would be carried beyond the harbor entrance and dropped at a distance where it could do no harm. The design of the jetty pier evolved in his plan over the years so that it looked finally like a boomerang with 1 elongated arm. Each year he found several opportunities to remind his superiors of the plan but without results. There were no funds appropriated for the harbor until 1852 and these for various reasons were not put to use until Lieutenant Webster was no longer associated with the harbor project.

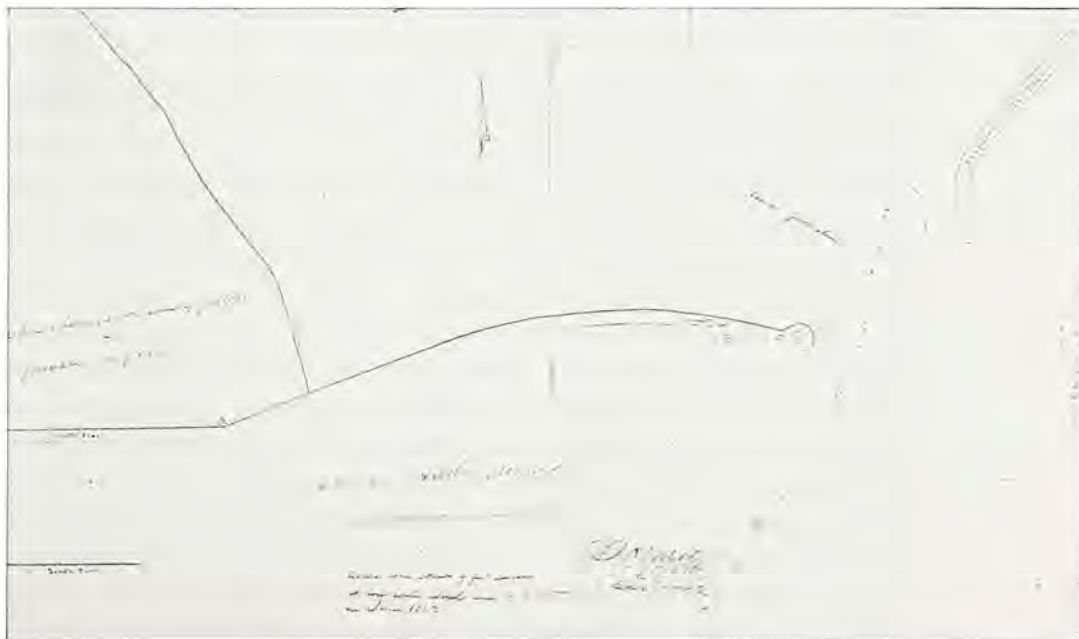
With no money coming from Washington for their harbors, communities along the lake found ways to make the most necessary repairs and improvements on their own. In the spring of 1850 Chicago city authorities raised funds and used the Federal dredge there to do the most necessary dredging. In 1851 the city council became interested in Lieutenant Webster's idea of a jetty pier or breakwater and might have funded its construction had not 1851 been a year of high water on the lake and free of trouble from sandbars.

At Milwaukee in 1851 local authorities spent \$3,000 to repair the north pier at the entrance to the harbor, but Milwaukee hung behind Racine in the extent of its self help to keep the harbor open. At Racine, between 1843 and 1851, by means of taxes, proceeds from sale of city land and contributions from private citizens, the town of less than 6,000 people invested over \$43,000 of its own money in the harbor. It had even purchased its own steam dredge for \$4,000 and provided \$1,000 a year to operate it.

At Kenosha, which had changed its name in the meantime from Southport, public-spirited citizens supplied \$7,000 in 1851 to repair, secure and extend the piers. Elsewhere, where as yet no Federal funds had been spent, as at Waukegan, Illinois, local merchants constructed bridge type piers into the lake so as to be able to load and unload ships, at least in fair weather. Most everywhere on the lakes it was hoped that the efforts at self-help were only temporary solutions and that eventually the Federal Government would recognize its obligations to internal commerce.

There was some ground for optimism as Millard Fillmore, the Whig Vice President who was a strong supporter of Federal improvements, had succeeded to the Presidency on the death of Zachary Taylor in July 1850. In his first annual address to the 31st Congress on 2 December 1850, he referred to "the vast lakes on the north and northwest" as being as entitled to appropriations from Congress for improvement as

Captain Joseph Dana Webster, who was in charge of public work on Lake Michigan from 1849 to 1854, was convinced that the accumulation of sand at the entrance to the Chicago harbor could be prevented by the construction of a "jetty pier" or breakwater. The configuration of the breakwater evolved in his plans but in 1852 he conceived it as shown in this sketch.



the Atlantic Seaboard. On 30 August 1852 President Fillmore signed a \$2,025,000 appropriation for about 100 works—many of them on Lake Michigan.

The Michigan City and Chicago Harbors each received \$20,000. The Milwaukee Harbor was allotted \$15,000 "to be extended at the point of the Milwaukee River known as the 'North Cut' surveyed by Lieutenant Center." Kenosha, Racine and Sheboygan Harbors received \$10,000 while Manitowoc Harbor was allotted \$8,000. In addition, the harbor at Waukegan, Illinois, received \$15,000 while \$30,000 was allocated for improvement of navigation on the Illinois River.

When harbor funds had been appropriated in the past no time had been lost in putting the money to work on the projects. At the very latest considering the August appropriation of 1852, based on past experience, work would be commenced in the spring of 1853 after the fall and winter months had been used to obtain under contract the materials which would be needed. A combination of circumstances delayed the use of the bulk of the 1852 appropriations for over 2 years.

Perhaps because of the great number of projects involved, planning and construction of the projects were divided, by a regulation of 10 December 1852, between the Engineer Corps and the Topographical Engineer Corps "as may be most advisable." As it turned out, the improvement of the lake harbors continued under the direction of the Chief of the Topographical Engineers.

In addition, the regulation of 10 December 1852 provided that from each of the two Corps a board of three members would be organized. All plans for river and harbor improvements must be submitted by the respective Chiefs of the 2 Corps to the boards formed from the respective Corps. The duties of each board were to examine, approve, modify, or reject every project or plan of civil improvement. Once such a plan was approved by the Secretary of War the plan would be carried into execution without alteration. If alteration or abandonment of a plan were considered necessary, it could be referred to the board for reconsideration. The boards would oversee the preparation of all plans and estimates, not only for new works but for works already in progress or for works to be repaired. In effect the regulation provided for a reevaluation and scrutinizing by a few individuals of a good many existing and proposed projects, a time-consuming effort under any circumstances, but perhaps more so in view of other developments.

On 4 March 1853 a new President, Franklin Pierce, took office. President Pierce was a Democrat and opposed to a Federal system

of internal improvements. On 7 March he appointed his Secretary of War, Jefferson Davis. Jefferson Davis was not adverse to keeping a very close rein on his department. One aspect of his policy is repeated again and again in endorsements in his own hand on recommendations returned to the Chief of the Topographical Engineers. No project, he said, would be approved on the assumption that subsequent appropriations for the project would be made. This was not an unwise policy for as it turned out President Pierce vetoed every internal improvement bill which came to his desk. Although the 1852 appropriations were large, they were spread out over many projects and few projects or portions of them could be made to fit the appropriations that had been made for them in 1852.

In response to a directive from Colonel Abert on 20 October 1852, in preparation for putting the August 1852 appropriations to work, Lieutenant Webster carried out surveys at Manitowoc and Sheboygan harbors, and at Milwaukee he obtained estimates for materials that might be procured "independent of the method of construction." For Chicago he prepared estimates for completing the north pier, repeating in his report of 23 November 1852 his views of the advantages of a jetty pier or breakwater. He also, on 6 December 1852, requested that an examination by the Board of Engineers be made of the Chicago Harbor to evaluate his breakwater plan.

In the spring and summer of 1853 United States agents were appointed to the various harbor projects and on 30 May Captain (since 30 March 1853) Webster was officially made general superintendent of all harbors on Lake Michigan. From 1 to 16 August 1853 Captain Webster accompanied Major Hartman Bache, member of the Board of Engineers for Lake Harbors and Western Rivers, on a tour of the projects under the Captain's jurisdiction. Meanwhile, a new steam dredge, provided for in the 1852 appropriations, was being built under contract for use on Lake Michigan.

Otherwise, by the end of the 1853 operating season, very little had been accomplished on the harbors when a directive from Secretary Davis of 4 November closed down all the works on the northern lakes, as an economy measure, and directed that the United States agents not be retained during the winter but that only a caretaker be kept at the various projects. Captain Webster managed to retain the agents by reducing their salaries to a dollar a day, about one-third their usual wage.

Unbeknown to Captain Webster, on 28 October 1853, Mr. John Wentworth who was a Democratic Representative to Congress from Illinois sent a letter to Secretary Davis which set in motion a series of

events which contributed to Captain Webster's resigning from the Topographical Bureau in the following spring. Like Captain Webster, Congressman Wentworth was originally from New Hampshire and had graduated from Dartmouth College. He had come to Chicago in 1838 and become editor and manager of a newspaper, the *Chicago Democrat*, and had been engaged in politics from that time forward.

Congressman Wentworth wrote the Secretary of War that "the interests of the administration require a change of topographical officers here as Lieutenant Webster is one of its most violent opponents, and lends his money, credit and talents to the establishment and support of the leading Whig paper of our state the *Chicago Tribune*." Wentworth enclosed an editorial from the *Chicago Tribune*, extremely critical of President Pierce and his administration. "The editorial," he concluded in his letter, "I have no doubt is from the pen of Lieutenant Webster."

Nothing happened until 20 January 1854. On that day Secretary of War Davis sent a copy of Wentworth's charges to Captain Webster requesting his comments, and on the same day approved a request from the Treasury Department for Webster's services under the Light House Board at San Francisco.

"The dates," Captain Webster wrote to Colonel Abert on 6 February 1854, "of the letter of the Hon. Secretary of War, and his approval of the request of the light house board for my services are identical, which circumstance creates the impression of some connection. . . ." "Mr. W's attack upon me," Captain Webster went on to say, "is most wanton, unprovoked, and his accusations utterly false and unfounded." Because of private affairs which required his personal attention and because of his "right to be defended against imputations on my character," he asked Colonel Abert to be allowed to remain for the present at Chicago, if necessary in a leave of absence status.

Captain Webster explained his side of the story to the Secretary of War in a letter of 1 February, where he wrote, in part, "ever since I have held a commission in the Army, I have scrupulously avoided interference with party politics. . . . My opinions of matters of party politics have long been of a character which would preclude my taking any violent part in them." He then went on to explain his connection with the *Chicago Tribune*. The late editor and principal owner, a Mr. Fowler, was a near relative to his wife. He had met Mr. Fowler one day on the street and the latter had informed Captain Webster that a new printing press had arrived from Boston but that it could not be claimed unless Fowler could provide some other name

besides his own as surety for an unpaid balance. Captain Webster claimed he never contemplated actually advancing money in the transaction but that Mr. Fowler became ill, retired from the paper, and left Captain Webster with the obligation to pay off the note. To protect his investment Captain Webster retained a part ownership in the newspaper, but "had never taken any management or direction of the paper nor have I ever written, dictated, prompted or been in any way privy to one line of its published matter having the remotest bearing upon politics." To back up his statement Webster enclosed affidavits from the new Editor of the Tribune as well as from prominent citizens including the Mayor of Chicago, all, except the Editor, distinguished members of the Democratic party. On 10 February Secretary Davis responded to the effect that Captain Webster's explanation was "entirely satisfactory to the Department."

In March Captain Webster went to Washington, apparently to straighten out matters with his chief and to win a delay if not a reversal of the order to report for lighthouse duty in California. On 23 March while in Washington he asked in writing from Colonel Abert to be relieved from the order. Colonel Abert took up the matter in a letter to the Secretary of War offering a number of reasons why it was in the interest of the War Department to retain Captain Webster at Chicago. With characteristic brevity and logic the Secretary, 2 days later, refused to "suspend the execution of the order." The inconvenience "to be felt by the War Department (in the loan of Captain Webster to the light house board) should have been presented," the Secretary explained, "at or before the time when Captain Webster was detailed."

While Captain Webster was in Washington a curious development took place in Chicago. In the spring of 1854 the Chicago Harbor was virtually closed with sand. Four vessels and 7 lives had been lost, and 2 other vessels damaged because of the lack of a harbor entrance.

The Chicago Board of Trade telegraphed Congressman Wentworth requesting him to ask the Secretary of War for the loan of the Federal dredge, agreeing at the same time to assume all costs and to return it in the same condition as it had been received. Wentworth's request of 21 March to Secretary Davis was answered 2 days later to the effect that "it is not within the power of this department to lend the property of the government." On 12 April Congressman Wentworth passed on to the Secretary of War information to the effect that the dredge had, in the meantime, been seized by the Board of Trade and Common Council of Chicago and was being used to dredge the harbor.

Captain Webster meanwhile had resigned his commission,

effective 7 April, and returned to Chicago. In writing to Colonel Abert on 6 May giving his views concerning the seizure of the dredge by the local authorities he could not resist closing his letter in this manner. "I may be allowed to say also that this sad calamity shows how well founded were my own repeated representations of the necessity of something being done to remedy the evil causes of the increasing bars off the north entrance." Retrieval of this dredge from the town authorities was to be left to Captain Webster's successor at Chicago, Lieutenant Colonel James D. Graham.

After resigning from the Topographical Engineers Webster stayed on in Chicago and went into business. He was president for a time of a commission that perfected a sewage system for the city, and he planned and carried out an operation whereby a large part of the city was raised 2 to 8 feet. While whole blocks were raised with jack screws new foundations were placed beneath them. He also attained the grade of Brevet Major General at the close of the Civil War in recognition of his war services. During the war he served for long periods as Chief of Staff for General Grant. After the war he returned to Chicago where he held a number of posts including that of Collector of Internal Revenue. He died in 1876.

John Wentworth meanwhile became Republican Mayor of Chicago from 1857 to 1863. In 1861 he sold his paper, *The Democrat*, to the Republican *Chicago Tribune*, and retired from journalism.

Chapter 6



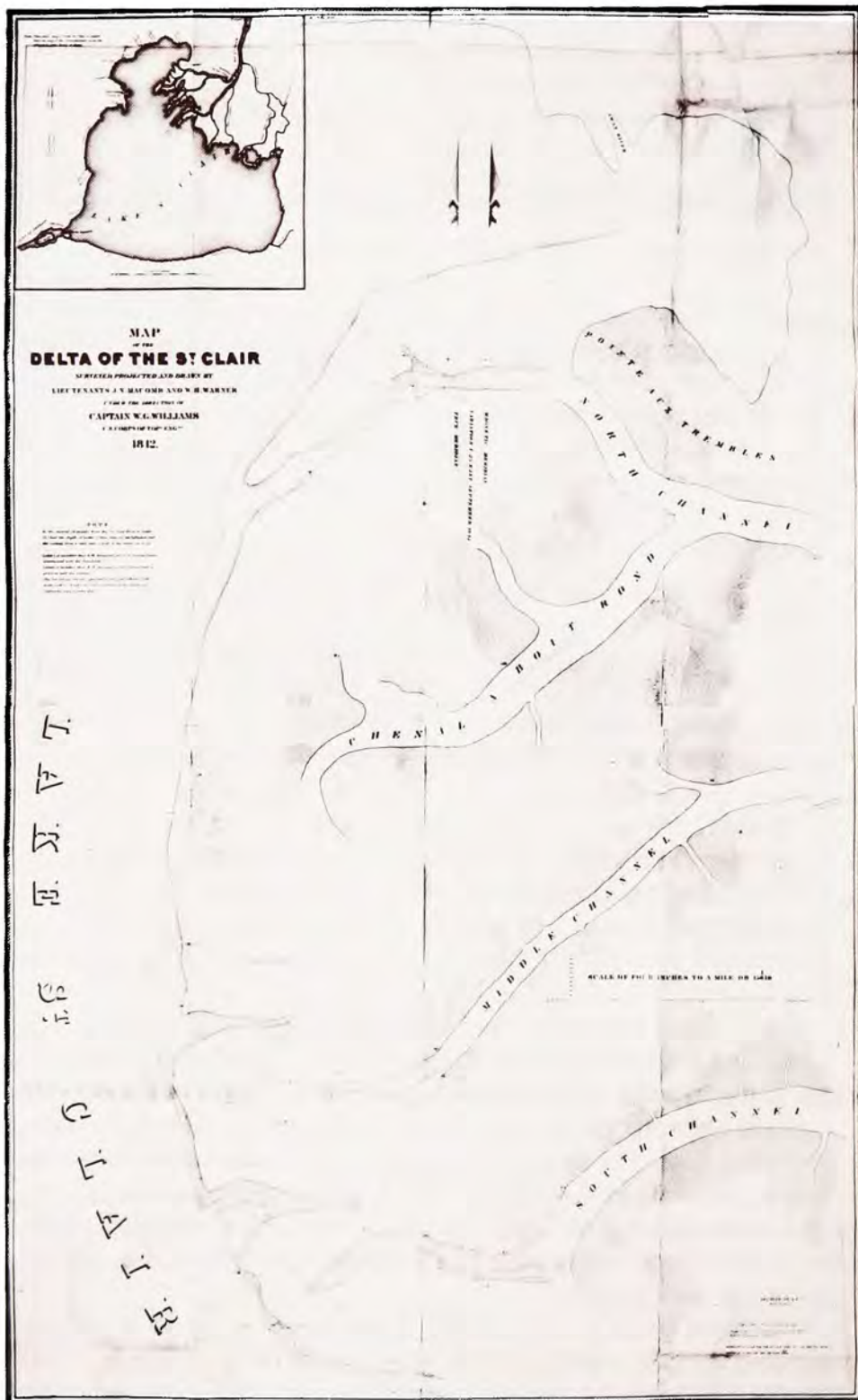
An end: A war: A new beginning, 1854-1866

On 20 April 1854 Brevet Lieutenant Colonel James D. Graham arrived in Chicago to take over responsibility for harbor improvements on Lake Michigan from Captain Joseph D. Webster whose resignation from the Army had become effective on 7 April. Colonel Graham who had been born in Virginia in 1799 was 55 years old. He had graduated from the U.S. Military Academy in 1817 and had distinguished himself as an astronomer. It was for his services as head of the Scientific Corps and principal astronomer for the United States during a joint demarcation of the boundary between the United States and Canada that he received the Brevet rank of Lieutenant Colonel in January 1847. Just prior to coming to Chicago he had acted as U.S. Astronomer in a survey of the boundary between the United States and Mexico.

Two days before Colonel Graham arrived at Chicago, Topographical Engineer Captain August Canfield who, from Detroit, had been responsible for the dredging of the St. Clair Flats, had died. Colonel Graham, as the senior field officer of the Corps stationed on the Lakes, asked for and was assigned, until October 1856, the United States projects in the Detroit area left unattended by Captain Canfield's death. Eventually, by 1857, Colonel Graham at Chicago would be made responsible for all the United States harbor projects on all the Great Lakes.

Colonel Graham very quickly solved the embarrassing problems growing out of the seizure by the Board of Trade at Chicago early in 1854 of the Federal steam dredge at Chicago. He politely demanded

An end: A war:
A new beginning,
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After vessels on the lakes began to get larger, around 1840, the St. Clair Flats at the mouth of the St. Clair River, an important part of the water link between Lake Huron and Lake Erie, became the most serious obstacle to shipping on the lakes. Since the shallow St. Clair Flats affected commerce between such lake ports as Buffalo in the East and Chicago in the West, the two ports joined forces and, under the supervision of Lieutenant Colonel J.D. Graham at Chicago, employed a U.S. Government dredge to cut a narrow passage through the middle channel of the flats in 1854.

the return of the dredge. This was done and on 18 May Colonel Graham put the dredge to work removing the bar which blocked the entrance to the Chicago Harbor. Operations were discontinued from 17 June until 5 July because of a breakdown and then were resumed until the 22nd of that month. In all, 18,000 cubic yards of sand was removed from the bar, placed in scows with drop bottoms and towed 2,500 to 3,000 feet out into the lake where at a depth of $4\frac{1}{2}$ to 5 fathoms, that is, 27 to 30 feet, the sand was dropped. The cost of creating the new channel, 600 feet wide and from $11\frac{1}{2}$ to 13 feet deep, was \$1,891 or $10\frac{1}{2}$ cents per cubic yard. Of the 66 days involved, only 36 were actual working days. The others were Sundays or they were lost to breakdowns, bad weather and heavy seas.

These figures were important to Colonel Graham because they prompted him to recommend dredging for a few weeks of each season as an alternative more certain to be effective and vastly cheaper than building a counter or jetty pier to increase the velocity of the sand-bearing shore current so that the particles of sand would be dropped at a point more distant from the harbor.

Fifty cribs, each 30 feet wide, 35 feet high, and 30 feet in length, each costing \$5,000, would be required for a jetty pier. The entire project would cost \$250,000. The annual expense of this alternative, based on 6 percent interest of the original cost plus estimated annual repairs totaling \$6,250, amounted to \$21,000. In contrast, a steam dredge would cost \$17,500. The annual interest on this amount at 6 percent would only be \$1,050, repairs would cost an estimated \$1,750, and working expenses \$2,500, making a total annual cost of \$5,300. "I would recommend," Colonel Graham wrote to Colonel Abert in December 1855, "that for several years to come, at least, the dredging should be resorted to in preference to any consideration of a counter pier."

Colonel Graham regretted that there was no first class steam dredge belonging to the Chicago Harbor and each year during this period he included an estimate for the purchase of such a dredge in his annual report to the Topographical Bureau. The available dredge was for all the harbors on the lakes. It was able to move under its own power but not more than 6 miles an hour. When it was necessary to move from one harbor to another, her engine was not powerful enough to tow the 4 scows needed for dredging operations. A vessel had to be hired to do the towing.

At its semi-annual meeting in October 1854 the Chicago Board of Trade adopted a vote of thanks to Colonel Graham for his dredging of the harbor. The Board had less reason to be pleased in the

years following. When dredging was completed at the Chicago Harbor entrance late in July 1854, the steam dredge was moved to Racine, Wisconsin, where, from 29 August to 31 October, 9,080 cubic yards of sand was dredged from the channel between the harbor piers. The work was frequently interrupted by unusually strong winds.

In the spring the dredge was moved to Kenosha, Wisconsin, and was employed there until the 8th of September. Between 29 May and 17 August 1855, only 39 days had been suitable for work. Thirteen thousand six hundred cubic yards of material, much of it stiff clay, was removed from the channel. During this same season, the corporate authorities employed a steam scoop dredge alongside the north pier and had established a depth of not less than 12 feet at the harbor entrance. For 2 weeks at the close of the season in 1855 the dredge was used to raise a pile driver and crane scow which had sunk in the Kenosha Harbor the previous spring.

While these activities were going on at Kenosha, by midsummer 1855, the sandbar at the entrance to the Chicago Harbor was nearly to the point where it had been prior to the 1854 dredging operations. A draft of no more than 7½ to 8 feet could be passed over the bar into the harbor. The Chicago Board of Trade, on 26 July, requested that it be allowed to use the Federal steam dredge for the purpose of dredging out the north channel of the harbor. A procedure permitting use by other than the Topographical Engineers of equipment had been worked out in 1854 in connection with the dredging of the St. Clair Flats with funds contributed by various Boards of Trade at the major harbor cities on the Lakes. Under the guidelines set by Secretary of War Davis the dredge and the dredging operations must remain under the direction of an officer of the Topographical Engineers but expenses might be paid for by private subscription. The dredge could not be used at Chicago in 1855 because it was located at Kenosha and numerous efforts to have it brought back to Chicago in the fall of 1855 were unsuccessful.

An incident occurred that fall at Kenosha which highlighted in a bizarre way the stress which can be commonly observed during this period and which grew out of the national issue as to the role and purpose of the Federal Government in making internal improvements such as lake harbors. Federal programs were partially funded by Congress and then abandoned or they would be taken up by local interests and pushed to completion with local resources. In some cases a smooth cooperation could be achieved between the Federal and local authorities and the results would be satisfactory. In other instances, misunderstandings created the opposite results.

On 27 September 1855 members of the City Council of Kenosha, accompanied by the Sheriff of Kenosha County, boarded the United States steam dredge lying at the south pier of Kenosha Harbor and removed an iron pile driver hammer weighing 2,000 pounds, an iron scoop or dredge bucket, 3 pieces of chain and other articles. The incident involved a scuffle between Charles Myers, the custodian aboard the vessel, and Sheldon Fish, an alderman or a member of the Kenosha City Council.

After this incident the Sheriff crossed to the north side of the river and seized a crane scow and a pile driver belonging to the United States and tied alongside the north pier while waiting to be taken along with 4 other scows by steamer to Chicago. The Sheriff put Mr. Fish and another man on board the vessels with orders to resist any person who might try to take them.

In response to a demand on 28 September from Colonel Graham for the "prompt restitution (of the articles) to my possession and custody," the Mayor, on the following day, maintained that "The property in question has been legally taken, and is legally held. . . ."

Colonel Graham replied the same day to the effect, in part, that "Kenosha, is but a small, and like each of the other cities (on the lakes) but an integral, part of that great commerce for whose benefit the appropriation for the improvement of Kenosha Harbor is made. . . . as well might your body undertake or claim the right to replevy upon the United States Light House, . . . or upon the United States Ship of War Michigan or her guns or tackle, were she lying in this port, as to do what you have done . . . I suppose you are aware that the penalty, in each case of conspiracy by false pretenses against your country may extend to years of imprisonment in addition to heavy pecuniary fine." On 1 October the Mayor was sick but the President of the Common Council informed Colonel Graham that the Council had voted to return the property.

In writing to Colonel Abert on 6 October, Colonel Graham called the "Kenosha cases (of trespass) . . . far more grave than anything that has ever occurred to my knowledge." The fact that the acts went unpunished "has increased the difficulty of my enforcement of the government regulations here," he said.

During the navigation season of 1856 the Federal steam dredge was used at Chicago to dredge the sandbar which had again returned to block the entrance to the harbor. In the following year only a narrow channel 12½ feet deep was available for ships near the north pier head, but no dredging was done for lack of funds. Instead, the steam dredge was used at Milwaukee where between 26 June

and 30 September some 32,000 cubic yards of sand was excavated from between the piers of the new harbor there.

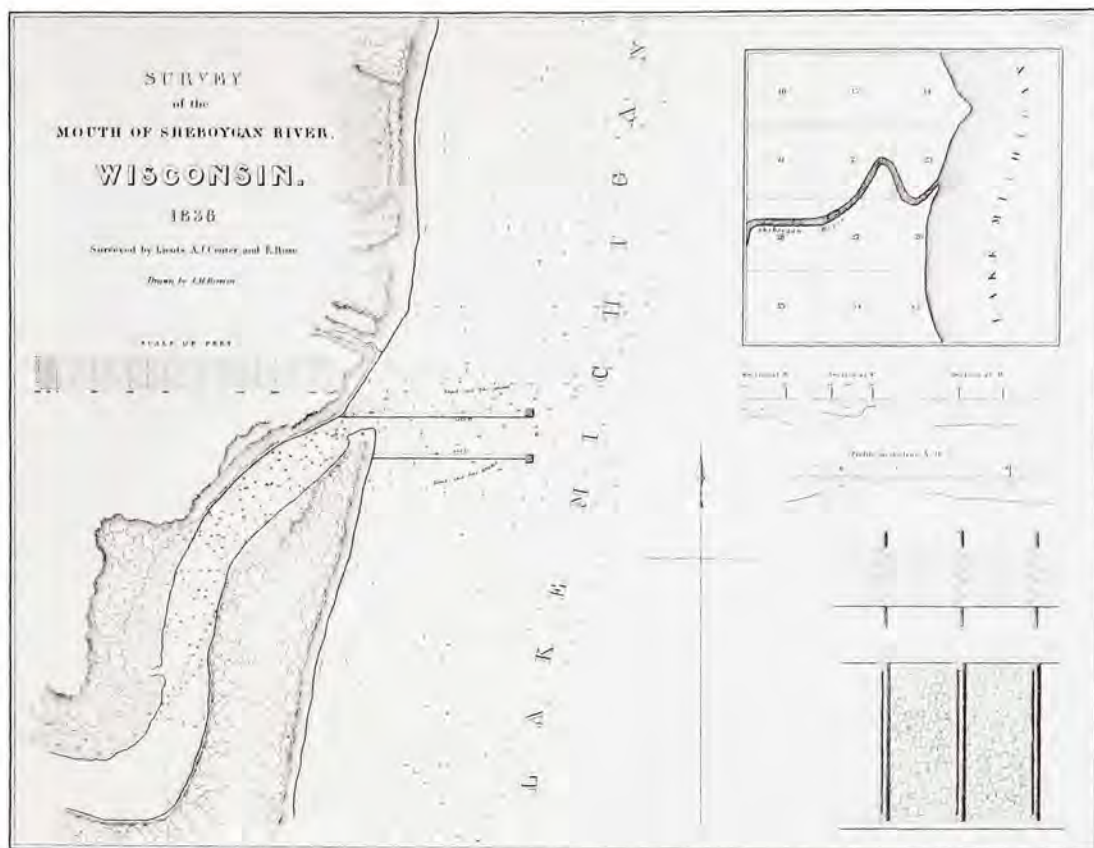
In most cases the harbor appropriations of 1852 were too small to be effectively used without followup appropriations. At Chicago by the end of 1857 Colonel Graham had sold "all the remnants of movable property belonging to the harbor, under the rules of the War Department, in order to raise a small fund, to patch up the most decayed parts of the piers, where breaches had occurred." These measures he felt were "inadequate to save the harbor from ruin, unless a speedy appropriation be made in aid of this very important work."

In 1858 when Colonel Graham was still "without a dollar of public money applicable for the repairs of the harbor" he used the expedient of putting the Federal dredge boat to work on the bar at Chicago and selling the sand to obtain funds to make the most temporary and emergency repairs. The Federal steam dredge on Lake Michigan, along with all those belonging to the United States on the Great Lakes, would soon be sold for lack of funds to keep them in repair.

At Waukegan, Illinois, where a breakwater had been proposed, 700 feet long, 25 feet wide, and to be placed in 20 feet of water at a total estimated cost of \$32,000, the 1852 appropriation of \$15,000 was exhausted in 1855. Only one pier could be placed because of severe weather. A second pier nearly completed and ready to be sunk was lost when a gale lasting 3 days tore it loose from its temporary mooring. All that remained of the 1852 appropriation was oak timber sufficient for 3 cribs and some machinery valued at \$2,000.

At Kenosha, where it was planned to extend the piers 800 feet and to repair the old works as well as to dredge, the 1852 appropriations were expended in 1855 partly in dredging and partly in upgrading and repairing the existing works.

At Racine, the \$10,000 appropriated in 1852 was used up in 1854 in the adding of 2 35-foot long cribs to the north pier, and in dredging. The U.S. Government operations at Racine were closed on 31 December 1854. Since Congress did not appropriate funds in 1855, in 1856 the people of Racine determined to push the work forward on their own and added 220 feet to the south harbor pier. Colonel Graham was not entirely satisfied with the work at Racine because hemlock timber had been used for the cribs and, though the construction was patterned after the U.S. cribs, the grill or lattice work at the bottom had smaller openings and this prevented ballast stone from dropping through. As a result the cribs settled unevenly. In 1857 the town of Racine extended the north pier another 220 feet.

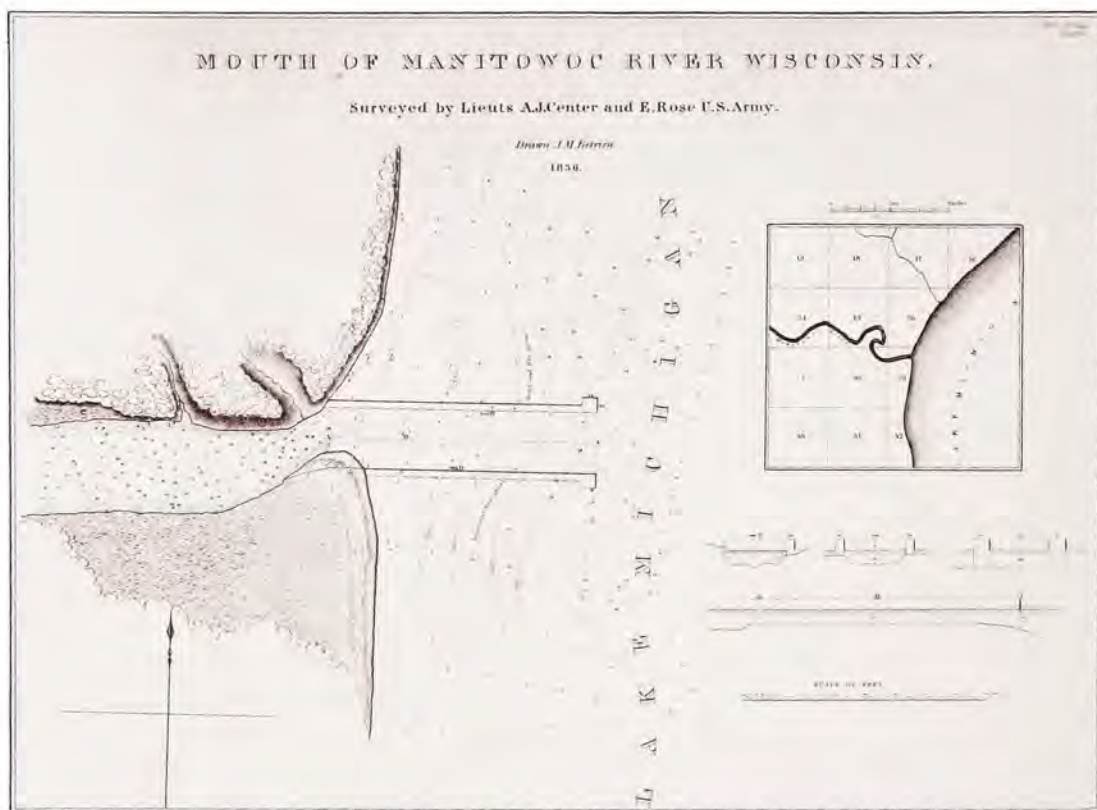


Further north, at Sheboygan, it had been planned, in 1852, to add 700 feet to the piers built there by county and town authorities. The plan to extend the locally owned piers proved impossible to carry out when the War Department ruled it could not accept ownership of the piers as offered by the town and county authorities and that it was unlawful to expend United States funds on property not belonging to the United States Government. Colonel Graham could not carry out the planned improvements but presumed it was lawful to spend some of the funds on dredging.

The plan at Manitowoc developed earlier by Captain Webster provided for 2 piers, one 600 feet long on the north side, and another 800 feet long on the south side. On 10 July 1854 construction was begun and by the end of the season 2 cribs had been placed on the north side and 5 on the south side creating 2 piers 60 and 150 feet in length. The funds appropriated in 1852 for Manitowoc were expended in 1854 and the U.S. agency there closed on 31 October.

A plan for the harbor at Michigan City had in 1853 called for the construction of a breakwater 1,000 feet in length at a cost of \$177,000.

A plan for improving the harbor at Sheboygan was drawn up by Lieutenants Center and Rose in 1836. Since no Federal funds were made available the town and county cooperated in constructing the piers to form a harbor entrance. When Federal funds became available after 1852 a legal technicality prevented their use. The War Department ruled that it could not accept ownership of the piers and that Federal money could not be spent on property not belonging to the United States.



Lieutenants Center and Rose also surveyed the mouth of the Manitowoc River in 1836. In 1854 construction was begun on a south and north pier. By the end of the season the funds appropriated in 1852 were expended on a north pier consisting of 2 cribs and 60 feet long, and the south pier with 5 cribs which was 150 feet long.

The \$20,000 appropriated in 1852 was insufficient to start construction of the breakwater and efforts were confined to maintaining the piers and dredging the channel.

One of the first things that Colonel Graham had done in 1854 after inspecting the harbors under his jurisdiction was to provide all the agents responsible to him specific instructions regarding the construction of cribs. From what he had observed of the condition of the harbor piers on the lake he made several changes in the usual mode of building and placing the cribs. He concluded, for example, that the piles heretofore driven into the lake bottom from inside the cribs were not strong enough to prevent cribs from tilting but were sufficiently strong to contribute to their pulling apart when they did tilt. Further, heretofore, the cribs had been securely attached to one another. When one crib tilted while its neighbor remained straight, the effect was to tear apart both cribs where they were joined. He found also that crossies as had been used up to this time in construction of cribs were not only too far apart, but they were not sufficiently strong. To remedy all these weaknesses he insisted that piles, 4 of them, be placed outside each crib to facilitate the settling as well as to



provide a place for craft to tie up. He also directed that the ends of cribs should no longer be joined by overlapping of side timbers but that they should simply be placed close together end to end. He also used 1-foot square crosspieces so placed as to divide the interior of each crib into 4 compartments. Like Lieutenant Allen before him he insisted that cribs be built with semi-open bottoms which allowed rock to fall into such open spaces as might develop by the washing away of soil.

Nowhere but at Milwaukee was Colonel Graham to have an opportunity to see piers constructed throughout according to his plan. Milwaukee made impressive progress with its harbor during this period. The townspeople were dissatisfied with the Board for River and Harbors' decision to improve the river mouth at Milwaukee in 1843, and continued to insist that a "straight cut" should be dug further north through the narrow strip of land which separated the inner harbor from the lake. In 1852 Congress appropriated \$15,000 specifically for improving the straight cut. The city raised an additional \$50,000 and together with Colonel Graham worked out an arrangement whereby both types of funds could be employed on the same project. The pier

From 1855 through 1857 the town of Milwaukee completed two harbor piers each over 1,000 feet long and opened a channel from Lake Michigan to the Milwaukee River large enough for the largest lake vessels. The piers were built according to the specifications and under the direction of the Topographical Engineers. The \$15,000 appropriated by Congress in 1852 for the Milwaukee Harbor amounted to only a fraction of the total cost, an estimated \$90,000.

work was divided into 4 sections. The city would construct sections 1, 2, and 3 while the Federal Government would construct section 4, the lakeward section of the pier work. The entire work was carried out under the supervision of the United States agent at Milwaukee, Mr. H.W. Gunnison, according to specifications of Colonel Graham.

By the end of 1856 the town of Milwaukee had 33 cribs in place. The length of the work at the north pier was 932 feet, at the south 736 feet. In May 1856 the United States began work on the 4th section. Only 5 cribs could be constructed with the funds available. Twenty-four thousand dollars would be needed to complete the section. Estimates for this amount had been forwarded to Washington in 1855 and 1856 by Colonel Graham but no appropriation had been made. The city, therefore, raised the funds to complete the work which consisted of 23 cribs, 32 feet long and 20 feet wide, all of which were put in place in 1857. The result was a north pier 1,088 feet long, and the south pier 1,056 feet long. Colonel Graham had the satisfaction of being able to observe that of the 64 piers, only 2 did not settle entirely vertical in the water. "So slight an inclination is scarcely a detriment," he wrote Colonel Abert, "when it is considered that the neighboring cribs are not disturbed by it, because they are not interlocked, one with another, at their ends."

Though Chicago could not boast of similar progress on its harbor in the 1850's it is at Chicago that other developments can be most dramatically observed. In the 1820's Fort Dearborn had dominated the site overlooking a bend in the Chicago River. In the 1850's Chicago had all but swallowed up Fort Dearborn and the city was negotiating with the Federal Government to excavate the bend.

No progress had been made by July 1854 on the proposed new lighthouse to be constructed on the head of the north pier at Chicago and Colonel Graham was asked to report on the situation and to draw up a plan. The lighthouse then standing had been built in 1832 on the south bank of the Chicago River near Fort Dearborn. "The city," Colonel Graham reported, "has now grown up around it to such an extent that the light is eclipsed from the view of vessels upon the lake. . . ." The lighthouse was obscured from the northeast by the Lake House Hotel and trees, and on the south side by trees, buildings, and the new Marine Hospital. "A segment of 177° of the horizon is required to be illuminated by the lighthouse, but . . . 81° of this segment is excluded from the benefit of the light by objects which did not exist when the lighthouse was built." Colonel Graham provided plans and estimates for a lighthouse and keeper's dwelling to be built on steel pilings as an extension of the north pier head. "Gas," he wrote Colo-



nel Abert in 1854, "now being used throughout the city, it will be easy to introduce it for use in the new lighthouse." The lighthouse was finally constructed in 1859.

Other changes which greatly altered the simple plan of the early Chicago Harbor have their origins in this period. By a law of 21 July 1852 the city of Chicago was authorized to excavate a portion of the Fort Dearborn reservation to eliminate a bend in the Chicago River and improve conditions for navigation. Colonel Graham worked with city authorities to establish the line of excavation, a matter which was not clear from the authorizing legislation.

On 25 September 1854, the Illinois Central Railroad applied for permission to open a passage through the south pier to connect with a proposed ship basin. Secretary of War Davis approved the application. In 1858 the Secretary of War authorized the Illinois Railroad Company to make a second opening in the south pier of the harbor, and in November of that year he authorized the Chicago Dock and Coal Company to make an opening in the north pier.

In the 1850's the commercial men of Chicago developed facilities so as to make the most of Chicago's position as a lake port and a growing railway center. Grain elevators and warehouses were built next to the water. Railway cars hauling grain in bulk could be run into the elevators on one side and boats could be loaded with dispatch on the other. In 1855 over 7 million bushels of grain were brought into the city by rail. Nearly all of it left Chicago by boat.

An end: A war:
A new beginning,
1854-1866

This drawing of Chicago in 1863 shows the north pier with its unusual curve and the south pier before openings were made in it by the Illinois Central Railroad for ship basins. The proximity of railroad and harbor are well illustrated by the locomotive and four cars approaching from the far left.

Changes in the harbor picture such as these are manifestations of the vitality and growth of the city which, in the ten years from 1845 to 1855, had grown from 12,000 to over 82,000 inhabitants.

In October 1848 a locomotive, a tender and 2 cars made the first run of 5 miles over the Galena and Chicago Union Railroad tracks. By 1855 Colonel Graham reported "there are as many as ten principal railroads which, at this day, concentrate at this port after having traversed and intersected an area of most fertile country of 163,240 square miles. . . ." During 1855 Chicago received over \$88 million and forwarded nearly \$98½ million in merchandise by railroad.

Movement of merchandise by railroad had not yet, however, eclipsed movement by water. The port of Chicago received \$95,700,000 and shipped nearly \$35 million in goods by lake. To this must be added traffic on the Illinois and Michigan canal which accounted for nearly \$7½ million in merchandise received and nearly \$81 million dollars in goods shipped during 1855.

The flow of merchandise was as one might expect. The products of the hinterland arrived at Chicago by rail and by means of the Illinois-Michigan Canal. Wheat, over 7 million bushels in 1855, came primarily to Chicago by rail while 6,622,000 bushels left primarily by way of the lake for eastern markets. Receipts from the lake were largely manufactured products from the east.



What was true of Chicago was true only to a lesser degree at other harbors on Lake Michigan.

Lake shipments at Milwaukee, which had an estimated population of 30,000 in 1855, were valued at nearly \$19 million while rail shipments still lagged behind at a value of between \$7 and \$8 million. Milwaukee was served in 1855 by 3 still uncompleted railroads. The Milwaukee and Watertown line opened on 1 October 1855 to a length of 45 miles; the LaCrosse and Milwaukee line opened to Iron Ridge, also about 45 miles from Milwaukee, on 21 November. The Milwaukee and Mississippi Railroad, which extended 95 miles from Milwaukee, was used to ship over \$11 million in merchandise in 1855. Lake shipments amounted to \$14,800,000.

The bulk of lake shipments was still carried in sailing vessels. Of the enrolled tonnage registered in the Milwaukee District in 1855 there was only 1 steamer, but 2 barks, 9 brigs, 81 schooners, 2 sloops and 4 additional large 3-masted vessels. The same, on a larger scale, was true at Chicago, where there were registered 2 steamboats, 4 propeller vessels and 5 steam tugs, which were greatly outnumbered by the sailing vessels which included 4 barks, 32 brigs, and 111 schooners.

Despite the fact that lake harbors had fallen into disrepair, little effort was made in 1859 to push a comprehensive harbors bill through Congress. Instead, the Republican party, which, at its first national convention in 1856 had come out strongly for "appropriations of Congress for the improvement of rivers and harbors of a national character," concentrated its efforts in Congress on the passage of an appropriation for further improvement of the St. Clair Flats.

In January 1859 the Republican-dominated State Legislature of Michigan adopted a resolution in support of an appropriation for further improvement of the St. Clair Flats, copies of which were sent to the Governor of all the northern States. The resolution emphasized that such activities were a Federal responsibility and gives the impression that further improvement of the St. Clair Flats was selected as a battleground on which to challenge the Democratic party concerning its position on internal improvements.

Late in 1859 Congress approved a special appropriation of \$55,000 for the St. Clair Flats improvement. The Democratic President, James Buchanan, took particular interest in the issue and twice, on 10 September and on 29 December 1859, requested the Secretary of War to provide him with background information on the improvement. On 2 February President Buchanan vetoed the appropriation

and in a long message to Congress gave his reasons. First, "the object which Congress intended to accomplish by the appropriation . . . had already been accomplished." More important, President Buchanan vetoed the measure because he did not believe Congress possessed the power under the Constitution to deepen the channels of rivers and to create and improve harbors. The responsibility for these matters belonged with the States.

President Buchanan's veto of the special St. Clair Flats appropriation bill on 1 February 1860 was the seventh appropriation bill for the Great Lakes vetoed by Democratic Presidents during the period 1838-1860. During these years only the general harbor appropriation bill of 30 August 1852 during the administration of the Whig President Fillmore was approved by the chief executive. Federal appropriations for river and harbor improvements along with the promise of free homestead and easy naturalization laws were promised in the Republican party platform of 1860. While these provisions appealed to the voters living in the Old Northwest, the promise of high tariffs appealed to manufacturing interests of the east. The party's anti-slavery platform helped to cement diverse interests in the North and it, along with the entire Republican party program, appeared contrary to the interests of the South. The Democratic party, split between southern and northern factions, could offer no effective opposition to the election of the Republican party candidate, Abraham Lincoln.

Although the election of Lincoln released the forces leading to southern secession and civil war, other developments such as the change and growth of the Old Northwest between 1820 and 1860 were responsible for increasing tension between North and South. The development of lake transportation after the completion of the Erie Canal had helped not only to settle the Great Lakes region but to bind its economic interests with those of the North Atlantic seaboard. The east-west pattern of communication and traffic established by lake transportation was, during the 1850's, further strengthened by the construction of rail lines between the eastern seaboard and the western system of lakes and rivers.

If the South, on the eve of the Civil War, became convinced that it could prosper without the North, many north of the Mason Dixon Line were just as convinced that the North would be better off without the southern States. In March 1861, after 7 southern States had formed the Confederate States of America, adopted a constitution and chosen a provisional president, Jefferson Davis, the "Atlantic Monthly," published in Boston, commented, "The secession of the gulf states from the Union, and the closing of the Mississippi to the products of the North-

west . . . would still more clearly show the value of the lake route to the ocean. Run the line of 36°30' across the continent from sea to sea, and build a wall upon it . . . higher than the old wall of China, and the Northern Confederacy will contain within itself every element of wealth and prosperity."

The Atlantic article quoted extensively from Colonel Graham's reports particularly that of 1855 which not only spoke of the importance in the commercial sense of the harbor at Chicago but also of its importance in the event of war. "There is still another (claim which can be presented in behalf of the preservation of the Chicago Harbor), of not less magnitude which is exclusively national. It is the influence it would have on the military defense of this part of our frontier, and the success of our arms in time of war. A single glance at the general map of the United States would be sufficient to show the importance of Chicago as a military position in conducting our operations in defense of our northwestern frontier in time of war."

Abraham Lincoln took office on 4 March 1861. On 3 April an attack on the United States garrison at Fort Sumter in South Carolina officially opened the war and on 15 April President Lincoln issued the proclamation that declared an "insurrection" existed and called upon the States for 75,000 militia. In the South 4 more States joined the Confederacy.

In 1861 both Captain Amiel Weeks Whipple, who was responsible for the St. Clair Flats improvement, and Captain George Gordon Meade, who was in charge of the lake survey at Detroit, were called to active duty. When the Civil War started there were 93 officers in the 2 engineering corps. Fifteen of these joined the Confederate Army. In all, 55 became generals during the conflict. Among the most distinguished was George Gordon Meade who, as a General and commander of the Army of the Potomac, inflicted a complete defeat at Gettysburg of the Army commanded by General Robert E. Lee, a former fellow engineer officer.

There was a shortage of engineer officers during the war and civil works held a low priority for funding when larger issues were at stake. Colonel Graham was directed, on 12 August 1861, to "repair without delay" to Detroit, Michigan, to take over the duties of Captain Meade as superintendent of the Survey of the Northern and Northwestern Lakes, which duties he was to discharge in addition to his other duties as engineer in charge of all lake harbors. In addition, Colonel Graham was appointed engineer for the Treasury Department's 10th and 11th Lighthouse Districts which together embraced all of the Great Lakes. Because of the war no junior officers were assigned to

Colonel Graham but some 24 civilian assistant engineers were employed during the war on lake survey work.

On 13 September 1862 Colonel Graham was ordered to temporary duty at St. Louis by the Adjutant General to sit as a member of a General Court Martial. At first he expected to stay only a few weeks, but as "it became evident from the great amount of testimony to be taken" that he would be in St. Louis for some time he requested of the Bureau, and received authorization, to close his office in Detroit and to rent in St. Louis for \$20 a month "a room . . . suitably furnished" and to bring to St. Louis two assistants from the Lake Survey office. This expedient was considered necessary to complete Colonel Graham's annual report of 1862.

Colonel Graham had been interested in the fluctuation of water levels on Lake Michigan since 1856 and during 1858-1859 his experiments led to conclusions concerning what he called a "lunar tide." His annual report for 1862 as well as for the previous and following years contain his discussions and extensive tables relative to this subject. Since so little could be accomplished, portions of his reports pertaining to lake harbor works were little more than a list of the 34 harbors on the Great Lakes for which Colonel Graham was responsible, along with the comment, "The annual inspection, required by the Army regulations to be made of these public works, could not, except in three cases, be attended to because there were no available means for paying the necessary expenses incident to the said inspection."

Before Colonel Graham was able to return to Detroit in April 1863, on 3 March 1863, the Corps of Topographical Engineers was abolished as a distinct branch of the Army and merged with the Corps of Engineers. Major Hartman Bache, who had taken charge of the Topographical Bureau on 11 April 1861 during an illness of Colonel Abert, continued as chief after Colonel Abert retired in September of that year. On 11 December 1861, Colonel Stephen H. Long succeeded him as chief. For some months before the consolidation, i.e., from 2 December 1862 to 3 March 1863, Major I.C. Woodruff was in charge of the Topographical Bureau although Colonel Long was still the ranking officer. After the consolidation Colonel Long became the ranking colonel in the Corps of Engineers and next in rank to Brigadier General Joseph G. Totten who was Bureau chief.

In his annual report for 1863 to General Totten, Colonel Graham again listed the 34 lake harbors under his responsibility and estimated that \$4,614,108 was needed for their repair and completion. He then commented,

All of these works except alone the harbor pier at Oswego, New York are in a condition more or less dilapidated. Some of them, indeed, have well nigh gone to destruction for want of appropriations which are necessary to save them, none, except in the case of Oswego, having been made since the year 1852. Hence we have 11 years of a deterioration without any means of remedy whatever.

Most of these works are intimately connected with the prosperity of the vast commerce and navigation of the lakes, and if the policy of keeping them up is to be continued they ought to be attended to without further delay.

On 2 April 1864 in a report to Washington he again urged that something be done about lake harbors.

In all my annual reports, since the year 1857 inclusive, I have earnestly called the attention of the government to the condition of ... all the ... lake harbors under my charge, and have recommended appropriations for their repair and preservation, but not a dollar has been appropriated for this object for very many years. Hence there have been no means for employing resident custodians, even, to look to and report their condition, nor to pay the simple expenses of visits of inspection by the officer in charge of the works generally.

Perhaps this would be a favorable occasion to urge the attention of Congress to the importance of taking care of these valuable works, and I beg leave most respectfully, to suggest it.

As Colonel Graham was writing this, his final appeal for funds for lake harbor works, he had unknown to him been relieved as of 1 April of his duties in Detroit. Colonel Graham learned of the reassignment on 10 April and on 30 April he wrote from Chicago, where he was sorting out lake harbor property before turning it over to Colonel W.F. Reynolds, his successor. Colonel Graham who was 65 years old in 1864 hoped to be assigned to active duty with the Army in the field. "I have there a gallant son, Captain William M. Graham. . . . I wish to be by his side in serving the Union cause. . . ." On 30 July the Chief Engineer wrote to Colonel Graham informing him of the Secretary of War's decision to assign him to superintendency of harbors on the seaboard for preservation and repair of which Congress had appropriated.

On 28 June 1864 during the first session of the 38th Congress the Senate also approved a House bill which provided \$250,000 for the repair and preservation of harbors on the Great Lakes. The responsibility for carrying out these repairs was assigned on 2 August 1864 to Colonel Thomas Jefferson Cram who had been in charge of harbor



This drawing of the Great Central Depot grounds adjacent to the Chicago Harbor entrance was made just after the Civil War. The war years had brought prosperity to Chicago which was far from the fighting fronts and able, because of its transportation facilities, to deliver the large orders placed by the Government for foodstuffs as well as to meet the demands from Europe for American grain.

improvements on Lake Michigan in the late 1830's and in the early 1840's.

Even before the Senate had voted on the House bill to provide funds to repair and preserve lake harbors, the Board of Trade at Chicago wrote to Secretary of War Stanton, on 4 June 1864, to assure that the Chicago Harbor would receive the consideration that its importance deserved. After the bill became law, on 6 July 1864, the Chicago Board of Works wrote the Secretary again, describing in greater detail the problems of the harbor and requesting an engineer officer be sent to consult with the Board. Chicago, accordingly, was the first harbor to which Colonel Cram gave his attention after being given the responsibility for lake harbor repair and preservation. In addition to Federal funds, \$75,000 was spent by the city of Chicago in 1864 and 1865 in dredging and in the extension of the north pier of an additional 437½ feet.

Before the end of the year, Colonel Cram visited and made recommendations for the repair of harbors at Racine, Milwaukee, and Sheboygan in Wisconsin. Some of the harbor works had "scarcely anything left to repair or preserve and in a strict construction of the act would have been cut off from any benefit in the appropriation, while from others much of the old work had to be removed before anything

new could be commenced." Nevertheless, during 1864, \$14,588 of the \$250,000 appropriation was spent, the rest being applied to continue the work during 1865.

In addition to the \$25,000 apportioned to Chicago from the Congressional appropriation of 1864, \$88,704 was appropriated for harbor work there in 1866. An appropriation of \$75,000 was made for the Kenosha Harbor in 1866. Racine was allotted \$3,600 from the 1864 appropriation, while \$23,910 was appropriated for its harbor in 1866. Milwaukee which was allotted \$15,000 from the 1864 appropriation received an appropriation of \$48,283 for its harbor in 1866. Manitowoc Harbor was appropriated \$52,000 in 1866, while Sheboygan Harbor which was allotted \$10,000 in 1864, received \$47,598 in 1866. For the harbor at Michigan City, \$75,000 was appropriated in 1866.

Doubts as to the constitutionality of Federal support of harbor improvements of this kind were swept away by the Civil War. In the first year after the war larger appropriations were made for these harbors than in any year before the war. Although the amount of appropriations and work accomplished fluctuated from year to year after the Civil War it always remained higher than it was at any period prior to the Civil War.



Part Two

Rounding out a century

1866-1916





Chapter 1



Chicago and nearby harbors

In June 1866 the Engineer Department assigned Major Junius B. Wheeler Superintending Engineer for various river and harbor improvements on Lake Superior and Lake Michigan. This 35-year-old, North Carolina born officer had graduated near the top of his 1855 class at the Military Academy before starting his military career as a Cavalry officer on frontier duty in Texas. He soon transferred to the Corps of Topographical Engineers, and then spent 4 years building roads in Oregon and Washington Territory followed by a year during which he taught mathematics at the Military Academy. During the rebellion of the seceding States he spent an additional 2 years teaching Academy cadets but saw sufficient military action to receive honorary promotion to Major for his "gallant and meritorious" services at the battle of Jenkin's Ferry, Arkansas, and to Brevet Colonel for his war services generally.¹

Major Wheeler's 1866 responsibilities included improvements as widely dispersed as Superior, Wisconsin, and New Buffalo, Michigan. Perhaps because it was more centrally located in reference to these harbors than Chicago, he set up a United States Engineer Office at Milwaukee. Two Corps of Engineers officers, Captain David P. Heap and Captain James W. Cuyler, were assigned to him. In addition to them, he employed two civilian engineers, W.H. Hearding and W.T. Cosgrain.

Captain Heap, who was responsible for four harbors around the southern end of the lake, made his headquarters at Chicago. He, like Major Wheeler's other assistants, was required to inspect the works

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The entrance to the outer harbor at Chicago in 1892. Nearly 11 million tons of waterborne commerce passed through this harbor entrance in 1889 but after that date receipts and shipments began to drop until by 1895 less than 3 million tons of goods passed through the harbor.

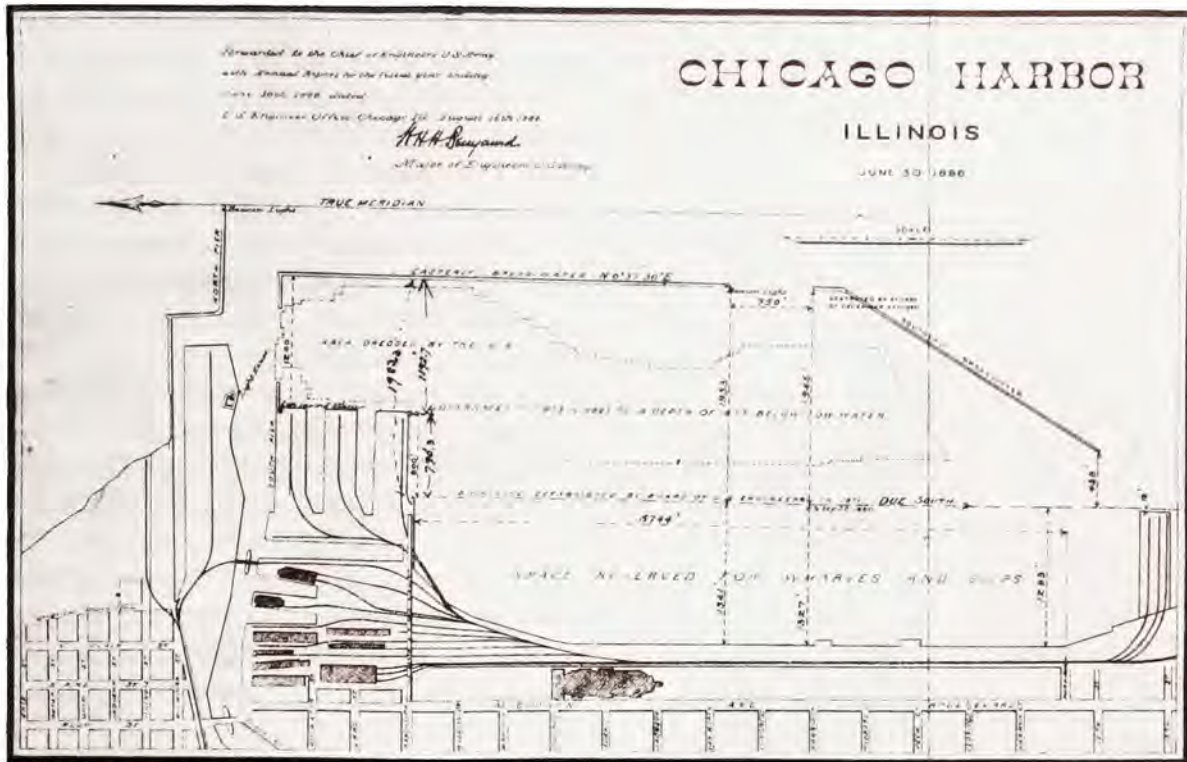


This artist's conception of Chicago Harbor in 1868 is not accurate in respect to details but it gives an impression of the busy commerce there. Upward of 10,000 vessels called at the harbor annually in the years following the Civil War.

and materials offered by contractors and to see that the improvement plan was being complied with. To assist him in these duties, a foreman was employed at each harbor to keep a daily record and report weekly on materials accepted and labor performed.

There was altogether too much paperwork. In 1867 Major Wheeler was disbursing funds and rendering separate monthly accounts for 24 different appropriations. "The greater part of my time is occupied," he complained, "in seeing these papers properly prepared. . . . Can there be no amelioration made in the law or regulations that would reduce this labor?"²

Major Wheeler was not the only officer to request that the burden of paperwork be reduced nor was this his only cause for dissatisfaction. Another impracticable requirement ruled that all improvements be carried out under contract. In the years immediately following the war, many contractors did not fulfill their contractual obligations. "In many cases," Chief of Engineers Brigadier General Andrew A. Humphreys commented in 1866, "no interest whatever is felt in the actual execution of the work by those from whom the material and labor are expected to be obtained."³ Major Wheeler would have preferred to hire equipment and labor and have the work performed



under his direct supervision. In the 1870's Congress gave the Secretary of War authority to do the work either by contract or by hired labor at his discretion.

Of the harbors under Major Wheeler's responsibility, Chicago was by far the most important. Chicago emerged from the Civil War as the giant of lake shipping. Three-quarters of all the waterborne exports from Lake Michigan was carried in lake vessels which loaded at one of the busy docks lining the Chicago River. Furthermore, Chicago had become the rail center of the United States. By the end of the war she was linked to the east by numerous railroad lines, and by 1867 had a direct rail connection with the Mississippi River at Council Bluffs, Iowa. Two years later, in 1869, Chicago had an unbroken line of rail connection all the way to the Pacific Coast. By 1870, with a population of 300,000, Chicago was the fifth largest city in the United States.

As at so many of the lake harbors, the pre-Civil War improvement at Chicago consisted of constructing parallel piers into the lake and dredging between them to provide access to the lower reaches of the Chicago River. This natural harbor appeared to require only the removal of sandbars at its mouth to allow lake vessels to approach the very doors of the wharves, warehouses and factories of the city.

The harbor at Chicago as it existed in the summer of 1886 after the construction of the easterly and southerly breakwaters so as to create an outer basin of refuge. Below the dockline shown in the foreground at the lower right, space was reserved for wharves and slips with the intention that crowded conditions on the Chicago River might be alleviated by the construction of harbor facilities at the lakefront.

When Colonel Thomas Jefferson Cram was in charge of harbor improvements on Lake Michigan from October 1864 to August 1865, he recommended extensions of the north and south piers at the Chicago Harbor. Congress provided the funds but, before construction could begin in 1867, a private firm, the Chicago Canal and Dock Company, approached Major Wheeler with a plan for providing docking facilities elsewhere than on the Chicago River. The company proposed that a 300-foot space be left between the end of the north pier and the beginning of a new 400-foot section so as to make possible an entrance from the outer harbor to a large ship basin which they wished to construct in the lake to the north of the north pier and parallel to the river channel. Permission was granted by the Secretary of War and the ship basin, called the Ogden Slip, was enclosed with cribwork by the Chicago Canal and Dock Company.

During fiscal year 1868-1869 the north pier was extended beyond the 300-foot opening to the Ogden Slip until it rested in water 23 feet deep, and in 1870, a 1,224-foot extension was added to the south pier. Major Wheeler was convinced, however, that the Chicago Harbor needed improvement beyond that of continuously extending the north and south piers farther into the lake. In July and August 1869 he surveyed the harbor entrance and lakefront and came up with a recommendation for an improvement which, though it integrated the existing structures, was a break for the first time with the original concept of improving the harbor primarily by means of two parallel piers. He proposed creating a protected area of about 455 acres, of which 185 acres was to be reserved for piers and slips, and 270 acres for harbor use. This was to be accomplished by constructing a breakwater 4,000 feet long southward and at a right angle to the south pier. The far end of this breakwater was to be joined to the shore with a pier. The enclosed area would be dredged to 12-foot depth.

This outer harbor was estimated to cost \$900,000 including \$30,000 for dredging the basin. Major Wheeler believed that "harbor facilities of the best and most secure kind become a matter of absolute necessity for the present vast extent and rapidly increasing growth of the commerce of Chicago. . . . In a commercial point of view Chicago ranks very high, probably the third or fourth port in the United States." "It is manifest," he added, "that the Chicago River is taxed to its utmost to accommodate the present condition of affairs and that it is entirely inadequate to meet the wants of commerce rapidly growing."⁴

On 5 January 1870 the Chief of Engineers formed a special board to consider Major Wheeler's plan for an outer harbor at Chicago as

well as for a similar harbor at Michigan City and certain improvements at the mouth of the Calumet River. The special board first met at the Tremont House in Chicago and, under the guidance of Colonel Wheeler, examined the proposed outer harbor area. It then adjourned to meet the following day at the United States Engineer Office in Milwaukee where Colonel Wheeler presented the charts, plans and reports pertinent to the recommended improvements. The board's conclusions, insofar as they touched on improvements at Michigan City and the mouth of the Calumet River, are dealt with below. As to Chicago, the board was unanimous in the opinion that an outer harbor was needed there. Congress agreed, and in September 1870 it appropriated \$100,000 to commence the project.⁷

Major Wheeler did not participate in the construction of the outer harbor project for he was relieved of his duties on the lakes on 3 May 1870 by Major David Crawford Houston. Major Houston was from New York State, had graduated second in his class at the Military Academy in 1856 and, like his predecessor, had taught at the Military Academy and served with distinction in the Civil War. Under Major Houston a United States Engineer Office was established in Chicago, also the site of his major project, the construction of the new outer harbor. Congress continued to appropriate sums ranging from \$75,000 to \$100,000 annually for this project until it was completed except for the pier which was to enclose the outer harbor to the south. Colonel Houston recommended against the enclosure because it was not yet clear if wharves would ever be established on the lakefront. "The decision (as to whether to close the outer harbor to the south) depends upon whether the lakefront is to be used for dock purposes. If not, then the basin as dredged will, it is believed, meet all the requirements of a roadstead for many years."⁵

Major Houston was relieved by Major George L. Gillespie in June 1874. Major Gillespie, who was born in Tennessee and who graduated second in his class from West Point in 1863, followed a military career which parallels that of his immediate predecessors. Unlike them, his responsibilities on Lake Michigan were confined to harbor improvements at the southern end of the lake. In 1875, under Major Gillespie's supervision, the superstructure for the outer harbor breakwater was completed using hired labor and materials purchased on the open market. He reported favorably on the effects of the outer harbor project, saying that sand no longer accumulated at the harbor entrance and that "mariners were showing increasing confidence in the security of the anchorage to be found there."⁶

Vessels were using the entrance to the outer harbor left open by

the decision not to construct a shore arm extension at the south end of the new breakwater. This had not been part of the original plan, but it was a development Major Gillespie thought highly of. He was disappointed, however, to find that the route to this entrance was being blocked by a shoal which resulted from the city of Chicago dumping material there which had been dredged from the Chicago River. On 27 November 1875 he wrote to the Chicago Board of Public Works respectfully requesting "... that you will give your directions prohibiting the dumping of any material dredged from the river at any point in the lake within the compass of a mile from the outer beacon." "All such material," he added, "might be utilized in the city. It ought not to be deposited where it can ever in the slightest degrees act detrimentally to shipping approaching the harbor."⁷

As the Board of Public Works did not respond to his letter, Major Gillespie brought the matter directly to the attention of the mayor and common council of the city. On 28 January 1876 he wrote them, "It is hardly necessary for me to enter into an extended discussion of the importance of carefully guarding against depositing material into the lake on the line of approach to the roadstead.... A great deal of dumping must have been done there late in the evening when the vigilance of my inspectors was suspended.... I would recommend that no dumping be allowed at all in the lake, and that all dredged material be required to be utilized in the city." In response, the mayor assured Major Gillespie that measures would be taken to control city dumping in a way not to interfere with the commercial interests of the port.⁸

Major Gillespie's experience was not an isolated one. The harbor of New York was also endangered during this period by dredging, filling and dumping and the New York Chamber of Commerce unsuccessfully sponsored a bill in the U.S. Senate designed to establish Federal control over such activities. In 1876 Chief of Engineers General Humphreys took up the matter and sent Congress a draft of a bill which among other things proposed outlawing dumping, construction, or filling in navigable waters except on authorization of the Secretary of War. There was little interest in the proposal, however, and it was not until 1890 that a beginning was to be made in such legislation.⁹

In the 1870's the size of both sail and steam vessels on the lakes increased, and to meet the demand for greater depths a Corps of Engineers project which provided for 16 feet of water was completed at the Saint Clair Flats in 1875. This opened the way for vessels of greater draft to ply between Lake Michigan ports like Chicago and

such eastern lake harbors as Buffalo, New York. On 15 June 1876, for example, the propeller vessel *Commodore*, largest of its class, took on a large amount of grain at Chicago, proceeded to Milwaukee to complete her cargo with miscellaneous freight and cleared that port with 2,600 tons drawing 15 feet 7 inches forward and 16 feet 4½ inches aft. At the time, this was the largest known cargo ever carried by a single vessel in the commerce of the Great Lakes. The size of lake vessels increased with each decade until by 1910 all the important harbors had to be dredged to accommodate vessels at 20-foot draft or more.

Major Gillespie was replaced in 1877 by Captain Garrett J. Lydecker. Captain Lydecker, appointed to the Military Academy from his home State of New Jersey, graduated at the head of his class in 1864 in time to participate in the Civil War and receive the honorary rank of Captain for "gallant and meritorious services" at the siege of Petersburg, Virginia. Among other duties he was assistant to Colonel Thomas Jefferson Cram in 1867 and 1868 working on harbor improvements on Lakes Huron and Erie. In 1878 he developed a plan for an additional breakwater at Chicago Harbor, to be placed about 1 mile north and east of the harbor entrance at an estimated cost of about \$600,000. A board of engineers convened at Chicago on 28 July 1878 and approved the plan. Congress authorized the project and provided the necessary funds.

Construction of the new breakwater was begun in 1882 under the direction of Major William H. Benyuard who replaced Captain Lydecker. Major Benyuard, from Pennsylvania, graduated from the academy a year earlier than Captain Lydecker and as a young engineer officer in the Civil War was kept busy constructing and dismantling bridges and building blockhouses and other defense works. Eventually he participated in the pursuit of the rebel army which ended in the capitulation at Appomattox on 9 April 1865. He emerged from the war a Brevet Major and a Captain in the Engineer Corps.

Between 1886 and 1890 Major Thomas H. Handbury continued the Chicago breakwater construction project. Major Handbury was the first officer since 1865 to be assigned responsibility for the Federal harbor project at Chicago and not to have seen service in the Civil War. He was followed in 1890 by an officer several years his junior, Captain William L. Marshall. Captain Marshall was a grandnephew of Chief Justice of the Supreme Court John Marshall (1755-1835). By coincidence he was assigned to the harbor improvement at Chicago precisely at a time when many objectives of the city seemed to

conflict with the supremacy of the Federal Government over navigable waters, a principle laid down by his granduncle, the Chief Justice, in 1824 and based on the commerce clause in the Constitution.

Laws had been enacted authorizing the Secretary of War to regulate bridges, clear wrecks from navigable waters and establish harbor lines. The River and Harbor Act of 1890 gave broad authority to the Secretary of War to prohibit activity including dumping of refuse which tended to impede or obstruct navigation. The law had many weaknesses, however, and was difficult to enforce.

Though Captain Marshall did not have the legal machinery to attack the abuses he saw about him, he was outspoken in his criticism, seemed testy to his Chicago contemporaries and was accused by them of breathing an "adverse spirit."

Between 1880 and 1890 the population of Chicago leaped from half a million to more than a million. Most of the increase was in foreign-born immigrants. By 1900 it acquired another half a million newcomers and had become the second largest city in the United States. It could also lay claim to being the world's greatest corn, cattle and timber market. For miles around the city the prairie was laced with train tracks. Much of the city was made up of grain elevators, cattle pens, storehouses, huge stations, and switchyards. Chicago had come to dominate the Middle West and, to a degree, the West as well, and Chicago increasingly controlled and absorbed surrounding areas. In 1889 its total land and water area was increased from 43 to 169 square miles. By 1910 it had expanded to over 191 square miles. In 1889 waterborne traffic at the Chicago Harbor was nearly 11 million tons. Chicago was to grow in every way but not in waterborne traffic at the old harbor along the Chicago River.

Like so many engineer officers in the 19th century, after graduating from the Military Academy in 1868, Captain Marshall was assigned to exploration duties in the west. From 1872 to 1876 he was in charge of the Colorado section of explorations west of the 100th meridian. He discovered Marshall Pass through the Rocky Mountains in 1872 and the gold placers of Marshall Basin on the San Miguel River in Colorado in 1875. From 1876 to 1884 he was an assistant engineer on various river and harbor improvements in Alabama, Georgia and Tennessee. He was then put in charge of certain harbor improvements in Wisconsin and in 1890 Chicago and other improvements in Illinois.

The outer basin for the Chicago Harbor recommended by Major Wheeler was maintained to a 16-foot depth until 1887. Thereafter, because of a dispute with the city concerning ownership of the submerged lands in the basin, dredging was halted. Congress con-

tinued to provide funds to keep in repair and replace the superstructure of the outer basin breakwater and this work was in progress when Captain Marshall took over responsibility for the harbor. In 1891 he recommended that, since the outer basin had never been used as planned and because of the litigation concerning ownership of submerged land along the lakefront, dredging be further postponed. Besides, he said, if the outer basin is ever used for harbor and dock purposes, the dredged material would be useful for filling docks.¹⁰

The city had other plans for the area and in 1891 considered filling in part of the basin as a site for the World's Columbian Exposition and, thereafter, using the area for a park. A site farther south was finally selected for the exposition but in 1893 a pier was constructed in the outer basin by exposition authorities so that steamers could land there and carry visitors back and forth between the harbor area and the exposition. Some dredging was carried out at this time in the outer basin by exposition authorities under a permit from the Secretary of War. The excavated material was used for filling lakeshore areas north of the harbor.

In making appropriations for the Chicago Harbor the River and Harbor Act of 13 July 1892 directed the engineer in charge there to submit a report concerning what improvements, if any, should be made by the Federal Government in the Chicago River. Captain Marshall wanted no part of it. The reasons for his objections are dealt with in greater detail in a subsequent chapter. Here it is sufficient to say he reported that, "No improvement in (the) Chicago River should be made by the general government; nor any public funds expended thereon so long as the city of Chicago uses it as a dumping ground for its filth and refuse of all kinds. The city," he added, "should be required to remove all deposits made therein that tend to diminish its present navigable capacity or to cease depositing its sewage therein."¹¹

As an added duty in 1893 Captain Marshall was placed in charge of the Engineer Section of the War Department's exhibit at the Exposition. Had his many duties permitted, he might have taken time that summer to hear an address given in Chicago by a young historian from Wisconsin, Frederick Jackson Turner, on "The Significance of the Passing of the Frontier in American History." Turner called attention to the report of the census of 1890 which announced that the frontier line which had hitherto played such an important role in the history of the country had by 1890 disappeared. The frontier had been an outlet sparing the new world from many of the complexities of European civilization. Whether Captain Marshall would have agreed with

Professor Turner on the role of the frontier is uncertain, but he knew the vast and scarcely settled regions of the west from personal experience and would have probably agreed that in 1893 Chicago presented problems vastly different from any known to the pioneer.

By 1895 litigation concerning submerged lands in the outer basin had practically ended in favor of the State of Illinois and the city of Chicago. The city council passed an ordinance directing the area shoreward of the dockline established by the Corps of Engineers in 1871 to be filled in for use as a public park. In July the Secretary of War issued a permit for construction by the city of a bulkhead along the dockline and for filling the area behind it except for a small yacht harbor at the southern end. Captain Marshall expressed no disappointment or resentment over the decision to create a park in an area where provisions had been made for accommodating Chicago's waterborne commerce once it became impossible to handle it in the Chicago River. However, he objected to spending Federal funds on the congested inner harbor and consistently favored development of the mouth of the Calumet River as an alternative.

For a man of his spirit there were many things to find fault with. He objected in the strongest terms to the use of the government piers at Chicago for forms of recreation less harmless than would be found in the new lakefront park. The United States had never acquired title to the lands occupied by the piers and exercised no police power over them. "The piers of this harbor," Captain Marshall wrote in 1895, "have long been infested with disruptable people and fishermen. Thieves, thugs, confidence men, liquor sellers and others of that kind make the United States piers and breakwaters the lowest of the slums of Chicago. . . . Numerous assaults and some murders have been committed upon these piers, and the summer nights are made hideous by drunken orgies. . . . They dwell upon the piers . . . and carry on their carousals . . . unchecked because the United States cannot allege ownership . . . and the city police seem well pleased to have the disorderly shore element transferred from the streets of the city to the Government piers out on the lake."¹²

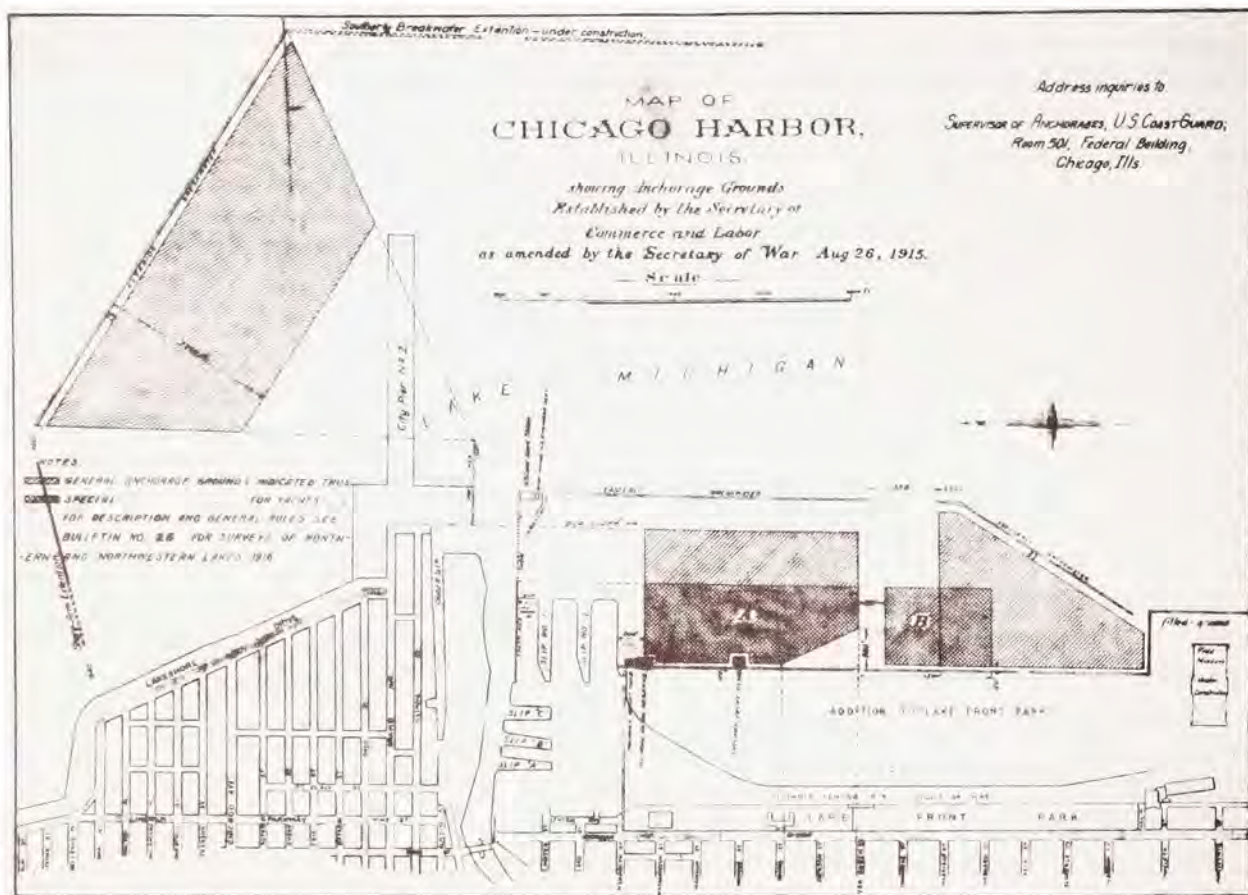
Elsewhere Federal structures for navigation were subjected to less colorful but frequently more destructive abuse. Section 14 of the River and Harbor Act of 3 March 1899 made it unlawful for anyone to use these structures for any purpose without permission from the Chief of Engineers, provided for penalties of up to \$2,500 or imprisonment for not less than 30 days for doing so, and empowered officers and their agents in charge of such improvements to arrest persons committing offenses prohibited by the law.

Section 13 of the same law dealt with a matter which had long been of concern to the Corps of Engineers and which had been the object of the earlier but not particularly effective anti-obstruction provisions of the River and Harbor Act of 1890. Section 13 of the 1899 law made it unlawful to throw, discharge or deposit refuse of any description into navigable waters of the United States without a permit from the Secretary of War. The law did not apply to operations authorized by Congress in connection with public works. The language of this act did not restrict offenses to those which obstructed navigation but generally the act was interpreted by the Corps of Engineers and the courts alike as a statute to protect navigation. Not until the late 1960's was its potential realized as a law to protect the environment generally.¹³

The River and Harbor Act of 1899 also appropriated \$100,000 for dredging the outer basin of the Chicago Harbor to a 20-foot depth. A contract was entered into to perform the dredging at 7 cents per cubic yard or about half the Government estimate. Prices generally declined in the decades following the Civil War and the cost per cubic yard of dredging declined from around 50 cents in the early postwar years to less than 10 cents around 1900. Improved equipment played a part in the decline in dredging costs but there were other factors. At times contractors competed not so much for the job as for the dredged sand which was put to many valuable uses.

The 1899 contract provided that the dredged material be dumped either in an area agreed upon by city authorities and the Secretary of War and located 2½ miles from shore and south of the outer harbor or at a fill area likewise agreed upon and close to shore, between 16th and 39th Streets. Before dredging could begin on the project city officials at Chicago, acting under old laws which had long been dormant, changed their minds and prohibited all dumping in Lake Michigan within 8 miles of the shore and between the northern limits of the city and the Indiana State border.

Captain Marshall had, meanwhile, been promoted to Major. His strong championing of a Federal position in respect to developments at Chicago did not harm his career. On the contrary, he moved up the ranks rapidly and, in 1908 during the Presidency of Theodore Roosevelt, was made Chief of Engineers with the rank of Brigadier General. After retiring from military service in 1910 President William Howard Taft appointed him Consulting Engineer to the Secretary of the Interior and, as such, he made reports on possible hydroelectric power development projects in various parts of the country. He held this post until he died in 1920.



By 1915 the outer harbor at Chicago had changed in that the city had elected to fill in the area at the lower right for a park and to provide docking and transfer facilities at a pier constructed by the city to the north of the old north pier. In addition, an exterior breakwater had been constructed by the Corps of Engineers and extensions to it were being built so as to provide protection for the new Municipal Pier.

Major Marshall was replaced late in 1899 by a classmate of his, Major Joseph H. Willard, a native of Illinois. Major Willard was easier to deal with than his strong-minded predecessor. Under his direction the original dredging contract for the outer harbor was annulled. A new agreement was reached between the War Department and the city of Chicago as to where the dredged material should be dumped and a new dredging contract was entered into. He did not push to test the legality of the city of Chicago's claims on Lake Michigan but wrote in 1901, "I am of the opinion that all future dumping should be made in accordance with the wishes of the people and the view of the health officers, and be made at least 8 miles lakeward and far removed for the city (water) intakes, to avoid all danger of polluting the water supply."¹⁴ By an act of 23 June 1910 (Public No. 245) Congress assured that the desires of the city would be respected and made it unlawful to dump dredged material or refuse of any kind in Lake Michigan within 8 miles of Chicago.¹⁵

Major Willard was replaced at Chicago in 1902 by an Ohio born 60-year-old veteran of both the Civil and Spanish American Wars, Colonel Oswald H. Ernst. Under his direction dredging was continued to establish a 21-foot depth in the outer harbor at Chicago and plans were made for replacing the wooden superstructure of the north pier with concrete. This project was continued under the supervision of Colonel Ernst's successor, Lieutenant Colonel William H. Bixby.

While Major Thomas H. Rees was District Engineer at Chicago (1908-1910) Congress, in the River and Harbor Act of 3 March 1909, authorized an examination and survey of the harbors and rivers at or near Chicago for the purpose of reporting a plan for a "complete, systematic and broad improvement of harbor facilities for Chicago and adjacent territory."

A comparison of this survey and examination of Chicago and adjacent harbors with the preparation which preceded the original harbor improvement at Chicago in 1833 accents the difference between frontier conditions and those after the turn of the century. In some respects the frontier had been free-for-all. When the Federal Government began to improve the Chicago Harbor in 1833 there was practically no one to coordinate with; the Indians were being moved farther west and much of the land was still in Government hands. The problems were largely obtaining the skills and materials to carry out the project, communicating with Washington and getting the funds to pay laborers and contractors.

After the turn of the century the question as to whether the Chicago Harbor should be further improved was an immensely complex one. In an area on the western and southern end of Lake Michigan 35 miles long and 3 miles wide including Chicago, South Chicago, Indiana Harbor, Hammond and East Chicago there were about 3 million people in 1910. The growth of such a large concentrated urban population was accompanied by urgent requirements to provide for the health and well-being of the city dwellers. Ways had to be found, for example, to dispose of the polluted wastewater produced by such large communities and sources of water had to be protected. As we have seen, these needs affected the carrying out of harbor improvements.

In addition, though such a trend was still in its infancy, there began to be a proliferation of government and quasi governmental agencies as well as private associations, corporations and firms which had to be consulted. In the course of carrying out the 1909 survey Corps officers at Chicago consulted with the State of Illinois Rivers and Lakes Commission, the Sanitary District of Chicago, the



Between 1915 and 1923, as funds were made available, the Corps of Engineers constructed a breakwater to protect the municipal pier built by the city of Chicago. This photo shows construction in June of 1916.

Chicago Harbor Commission, the Mayor of Chicago, the Chicago Plan Commission, the City Council of Chicago, and officials of adjacent cities. Among the associations which became involved in the study were the Citizens' Association of Chicago, the Lumbermen's Association, the Chicago Association of Commerce, and the Shipmasters' Association.

By 1909 the area included manufacturing and commercial establishments of such capacity that even today their names are synonymous with great size. Those contacted for study input included the International Harvester Company, Western Electric, Edward Hines Lumber Company, Armour Grain Company, Standard Oil, General Chemical Company, Inland Steel, Indiana Steel, Universal Portland Cement, Sears, Roebuck, and Montgomery Ward and Company. Hundreds of smaller organizations were also asked to provide information on the quantity and nature of their use of water transportation and the improvement they thought advisable.

Major Rees' report (13 September 1909), a subsequent survey carried out by his successor Lieutenant Colonel George A. Zinn (1911-1914) and a report of 30 July 1913 of the Board of Engineers were efforts to determine what the future steps toward improvement of the Chicago Harbor should be. All, however, expressed doubts concerning Chicago's potential for development as a harbor. "... the general interests of navigation have been made subordinate to other needs," wrote Colonel William M. Black, senior member of the Board of Engineers in 1913. The Board was particularly critical of the fact that, despite the expenditure by the Federal Government of public funds for harbor improvement, the city of Chicago provided no public wharves or public terminal facilities.¹⁶

The city of Chicago meanwhile had also become concerned about the declining commerce and initiated studies of its own. A harbor commission appointed by the city council reported in 1909

The Municipal Pier, now called Navy Pier, was constructed by the city of Chicago between 1915 and 1917 so as to provide an outer harbor for handling freight and passengers and to replace wharves no longer in use along the Chicago River.



recommending the development of an outer harbor just north of the entrance to the Chicago River. The new harbor was to be for handling freight and passengers and to replace wharves on the Chicago River which were no longer being used.

No immediate action was taken but in 1911 the city of Chicago decided on a plan for establishing a harbor on the lakefront and desired the cooperation of the United States to the extent of constructing a protecting breakwater for the new harbor facility. The River and Harbor Act of 25 July 1912 appropriated \$350,000 toward the improvement. Construction of the breakwater, however, was not to be commenced "... until assurances satisfactory to the Secretary of War shall have been received that the work contemplated by the city of Chicago ... will be actually undertaken and completed by said city." The latter provision did not grow out of circumstances peculiar to Chicago. Congress increasingly insisted on forms of local cooperation as a condition of Federal river and harbor projects.

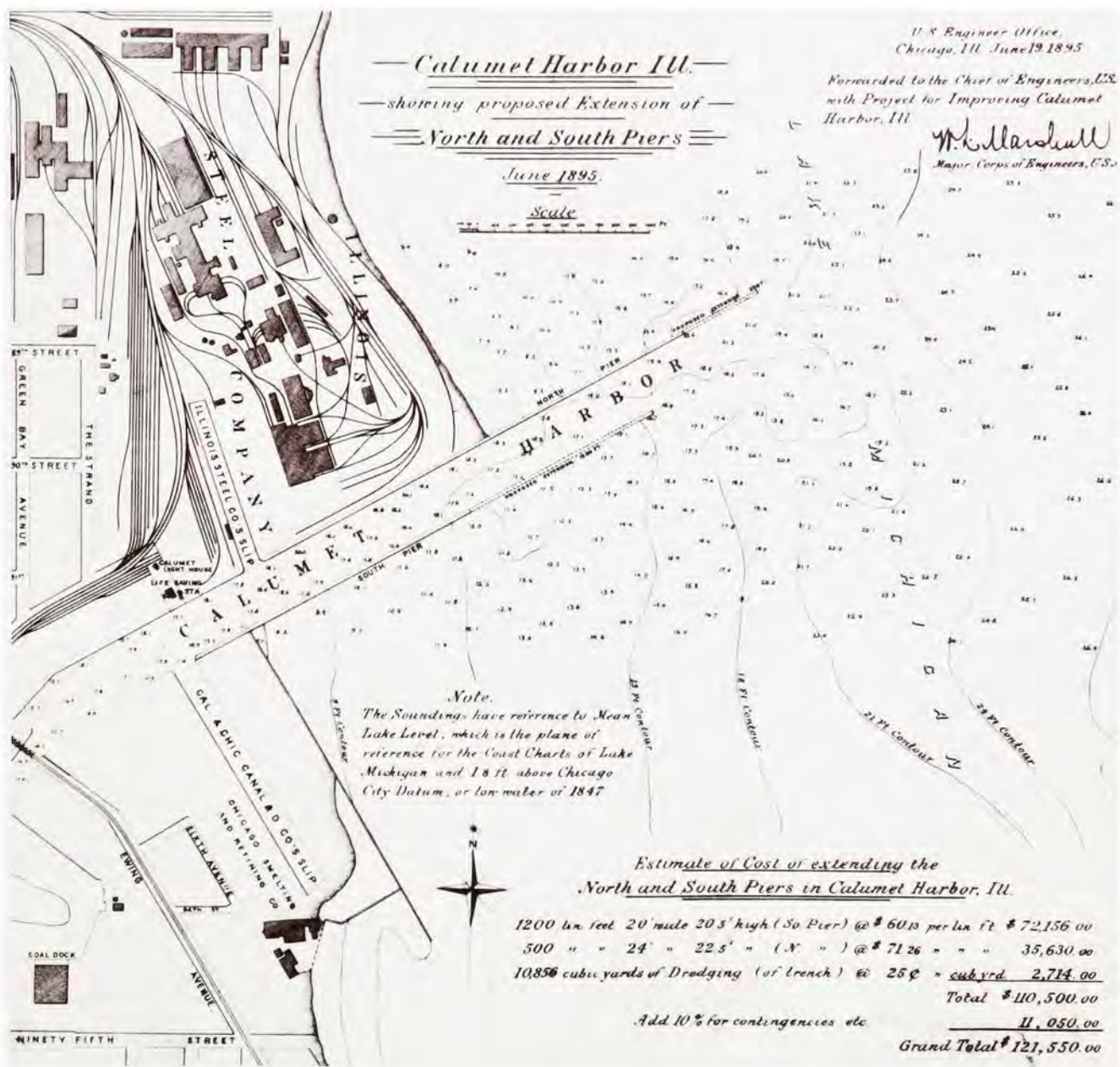
The city of Chicago began construction of the Municipal Pier in 1915 and completed it at a cost of \$5 million in 1917. In 1915, the Corps of Engineers, under the direction of Lieutenant Colonel William V. Judson, began work on a shore arm extension to the existing exterior breakwater to protect the Municipal Pier. The work progressed as funding became available and was completed in 1923 at a cost of \$4.5 million.

By 1916 waterborne commerce at the Chicago Harbor dropped to 2½ million tons, less than a quarter of what it had been in 1889. The loss was only apparent, however, for the bulk of the vessel traffic had shifted to nearby Calumet Harbor at South Chicago and South Chicago had become a part of the larger city.¹⁷

Calumet Harbor

With a population of hardly more than 1,000 in 1869 the town of Calumet, later South Chicago, offered little promise and certainly nothing to suggest that in a few decades Calumet Harbor would supersede Chicago as the major port on Lake Michigan. Major Wheeler recommended against improving the harbor there. In 1869 he wrote, "The local wants of this place at the present time, or for the next ten years to come, do not justify the expenditure."¹⁸

Nevertheless, to provide for a harbor of refuge at the mouth of the Calumet River for vessels unable to enter the Chicago Harbor during rough weather Congress, in July 1870, appropriated \$50,000 to begin



improvements there. The river was widened and deepened, more direct access to the lake was provided by cutting through a sand spit above the natural mouth of the river, and two parallel piers were built out into the lake to a depth of 12 feet. In 1876, 136 vessels with a combined tonnage of 41,000 tons used the harbor and the improvements clearly contributed to the growth of the community. In 1880 the steel

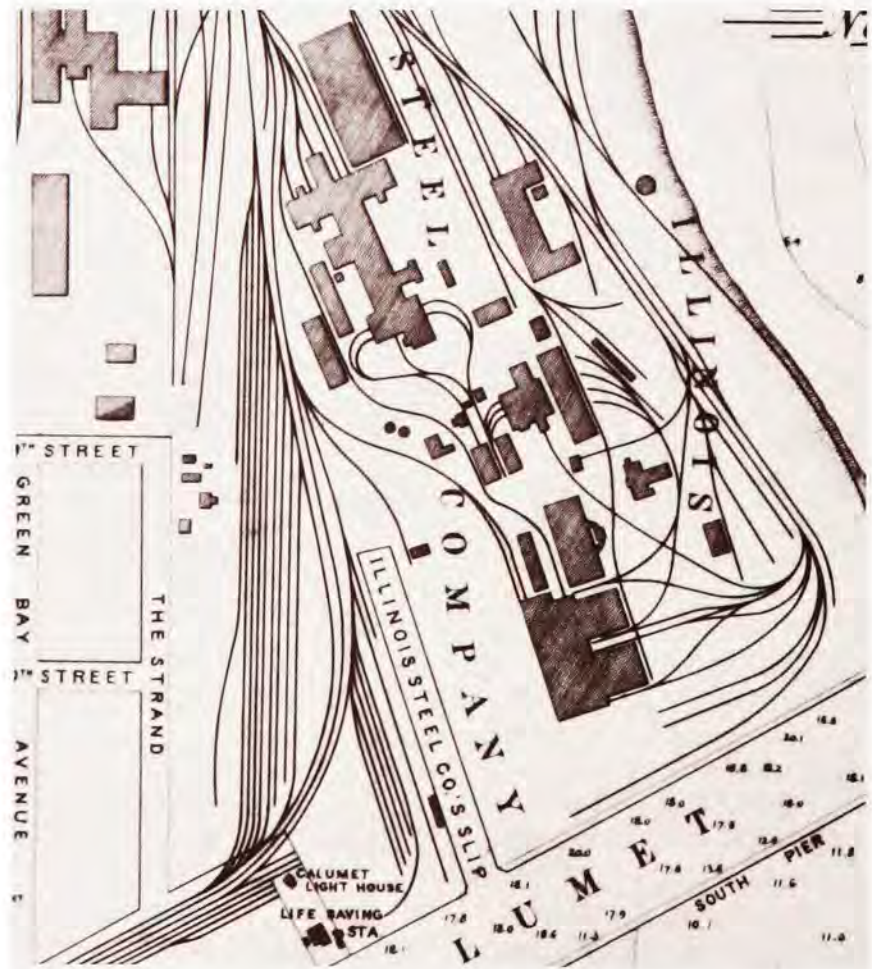
The general layout of the Calumet Harbor in 1895. On the north bank of the entrance channel the Illinois Steel Company had just erected a large plant.

Chicago and nearby harbors

industry began in South Chicago with the construction of the North Chicago Rolling Mill Company. About the same time the Chicago, Rock Island and Pacific Railroad built a branch line into South Chicago and constructed a large grain elevator there.

The lake harbor, railroads, steel and grain became four of the most significant factors in the development of South Chicago. Growth of steel mills meant increased demand for the bulky raw materials which go into making steel. These materials were mined or quarried near the Great Lakes and were well adapted to being transported by water. Grain from the prairies of the West came to South Chicago by rail and was stored in the grain elevators that lined the Calumet River before being shipped by water to eastern lake ports. Shipments were confined almost entirely to grain while the receipts were almost solely iron ore, limestone and coal.

Destined to become one of the largest of its kind in the world, the Illinois Steel Company contributed greatly toward making the South Chicago harbor one of the largest ports on the Great Lakes.





Over the years the piers at the harbor entrance were extended until, by 1896, the north pier was 3,640 feet long, the south pier was 2,020 feet long and the original project was completed. A channel 16 feet deep was maintained from the lake to the Calumet River. In 1893 Captain William L. Marshall recommended construction of an outer breakwater and in 1896 Congress authorized the project. When completed in 1915 the breakwater provided safe entrance to the Calumet River and an exterior harbor of refuge of about $\frac{1}{2}$ square mile in area. Both provided navigable depths of 20 feet.

In 1889, when lake commerce at Chicago peaked with a record 11 million tons, only 750,000 tons was recorded at Calumet. By 1916 the

By 1922, when this outline of the Calumet Harbor was made, the Corps of Engineers had completed a breakwater and the harbor had attained its position as leader among Great Lakes ports.

situation was turned about; Calumet Harbor had 10¼ million tons of commerce while that at Chicago had dropped to under 2½ million tons. Chicago commerce, however, was in less bulky products for the total valuation of its commerce in 1916 was about \$231 million while that of Calumet was about \$215 million.

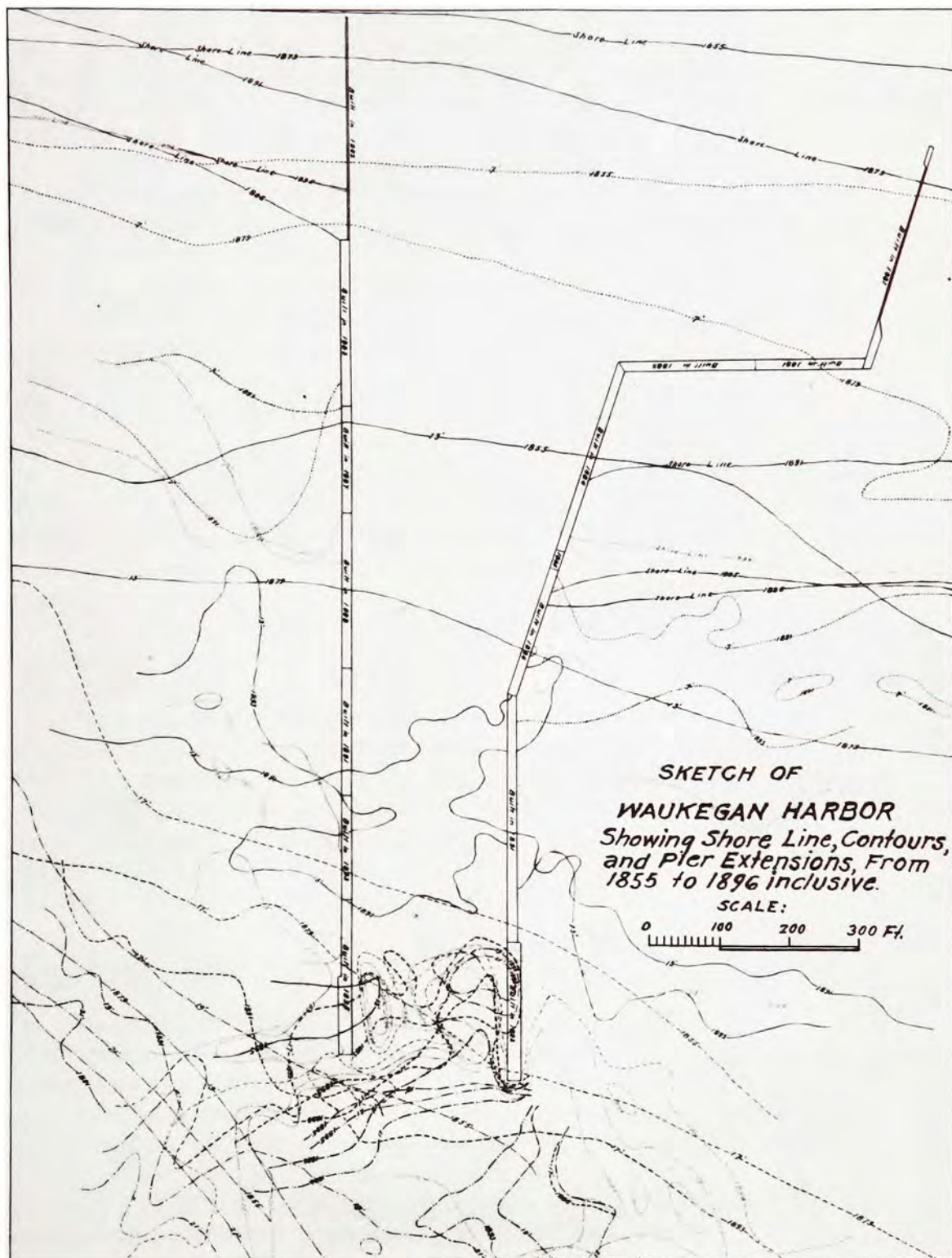
Waukegan Harbor

Chicago was a magnet which drew more commerce than it could conveniently handle. Along with Calumet Harbor, Waukegan Harbor, some 35 miles north of Chicago, benefited from Chicago's powers of attraction. Waukegan lacked every natural advantage and was slow to develop as a port. Although there was a small stream emptying into Lake Michigan near the city, it was of no importance for a harbor. A project for creating an outer harbor by constructing a breakwater failed in 1852 when a single crib placed in position was carried away by a storm.

Waukegan thrived without a harbor because it had early access to railroad connections. The Illinois Parallel Railroad Company, later the Chicago, Milwaukee and St. Paul Railroad, was built along the shoreline from Chicago to the Wisconsin State line in 1855 and it accounted for the growth of the city in the years following the Civil War. By 1872 Waukegan had a population of about 5,000 and had two planing mills, three tanneries and two flour mills. The only harbor facility was an 18-year-old bridge pier stretching 500 feet into the lake. The only business at the pier was the occasional unloading of lumber; there were no exports. Grain shipping and other commercial business was done by means of the railroad which ran directly through town. When Major David Crawford Houston surveyed the shoreline at Waukegan in 1873 he concluded that, "The local commerce does not warrant any expenditure by the government for a harbor at this locality."¹⁹

Citizens of Waukegan continued to press for a harbor and in 1879 Lieutenant Colonel David Crawford Houston formulated a plan for creating an artificial harbor off the shoreline. The plan called for enclosing a rectangular area of 16 acres of Lake Michigan with some 2,500 linear feet of pile piers, building a dock front 1,260 feet long along the natural shore and dredging the enclosed basin to 12 feet. In 1882 the project was modified to greatly reduce the area of enclosed harbor in the lake, but additional room was provided by dredging an interior basin in the low ground between the shore and

Facing page:
This sketch of the Waukegan Harbor in 1896 shows Federal improvements there since 1881. An atypical form of the pier to the right, which provided increased width between the piers at their shoreward end, originated in the necessity for creating an outer harbor at Waukegan where, unlike most Lake Michigan harbors, there was no river suitable for development as an inner harbor.



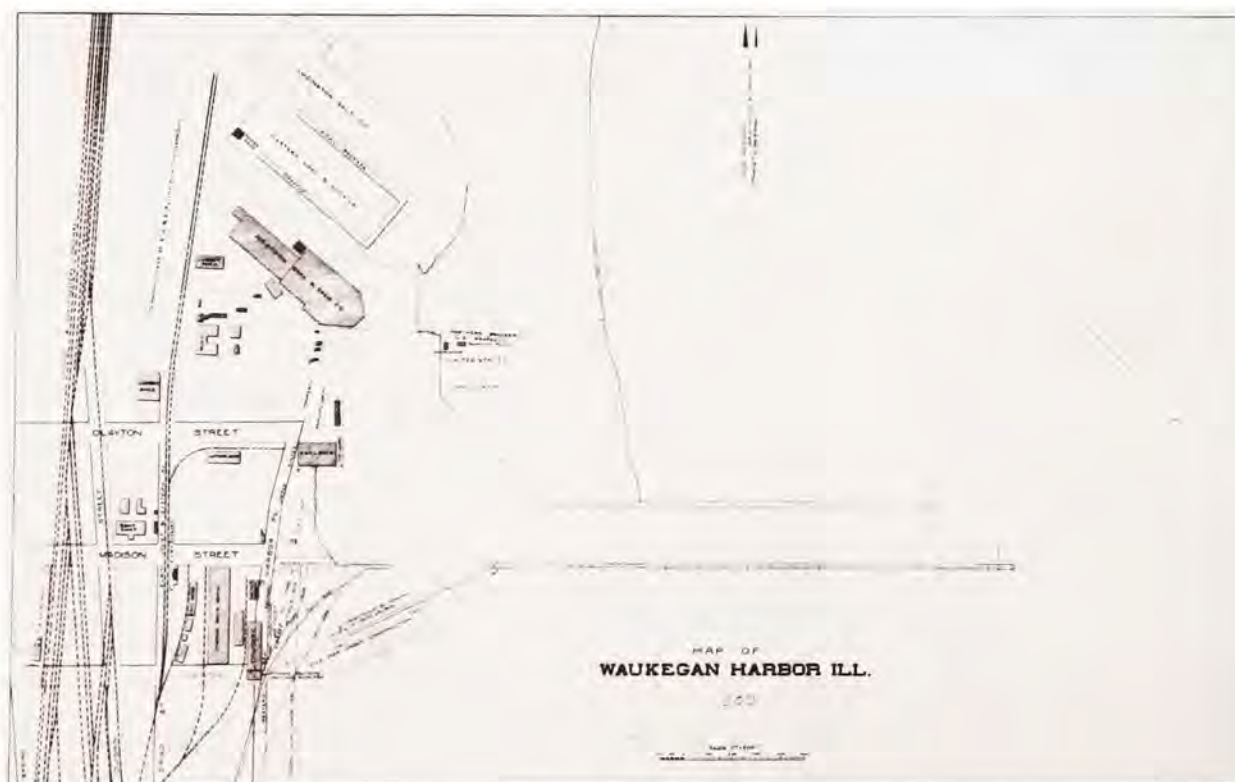
Chicago and nearby harbors

By 1909 at Waukegan Harbor the Federal Government had made extensions to both harbor piers and added a breakwater.

the bluff and connecting this artificial interior basin with the exterior basin by a narrow channel. The configuration of the outer basin differed from the usual harbor improvement in that the two piers were 850 feet apart at the shoreline and, while the southern pier extended straight out into the lake, the north pier zigzagged toward the south pier until the distance between them was only 235 feet.

Interest in further improving the harbor originated in the growth of the community in population and industry during the final decade of the 19th century. When the United States began the harbor improvement there in 1880, the only lake trade was in tanning bark from Michigan and lumber for local use. In 1889 Waukegan became the terminal of the Elgin, Joliet and Western Railroad which was connected with more than 30 railroads running to all parts of the country. Industry followed the railroad and in 10 years the population of the city doubled from about 5 to 10,000.

The River and Harbor Act of 3 March 1899 provided for a survey and estimate of cost for a 300-foot wide and 20-foot deep channel. The survey was carried out by Captain James G. Warren who oper-



ated out of a United States Engineer Office at Milwaukee, Wisconsin, which in time became the Milwaukee District of the Corps of Engineers. Captain Warren recommended replacing much of the north pier with a pile dock and extending both it and the south pier farther into the lake. He also suggested a breakwater such as was being planned for Racine and Kenosha Harbors. "Experience indicates," he advised, "that wherever harbors in this district are deepened to 20 or 21 feet storms from a northeasterly direction produce serious disturbances. . . ."20

Before Captain Warren's project could be commenced the Elgin, Joliet and Eastern Railroad constructed slips in the harbor, while the city of Waukegan dredged the channel between the piers and in 1900 constructed a 412-foot timber dock. As a result of the city's dredging, a 17-foot channel was available for vessels carrying coal. A coal company equipped with modern coal handling appliances obtained privileges at one of the slips. In addition, an elevator company with large grain elevators in South Chicago obtained dock privileges at a slip still to be constructed. Waukegan began to function similar to South Chicago in providing space for commerce avoiding the congestion of the Chicago Harbor. The River and Harbor Act of 30 June 1902 provided for a 20-foot depth at the harbor, extension of the piers and construction of a breakwater. These projects were completed in 1904.

In 1889, 56,000 tons of freight was received at Waukegan Harbor while only 1,500 tons was exported. By 1911 receipts had risen to 211,000 tons, primarily hard and soft coal, but also salt and general merchandise. In 1916 the value of Waukegan's waterborne commerce exceeded \$5 million, a modest accomplishment compared with extraordinary growth at Calumet Harbor, but sufficient to justify the harbor improvements which had been carried out there.

Indiana Harbor, Indiana

Like Waukegan Harbor, Indiana Harbor on the southwest shore of Lake Michigan was entirely man-made. Before the United States Government took charge in 1910 private enterprise constructed piers which extended into Lake Michigan, dredged the area between them to a depth of 21 feet, and began to construct a canal to connect the harbor with the Little Calumet River.

An act of 25 June 1910 provided for adoption of the harbor project by the Federal Government. As it was difficult to enter the harbor during storms Congress, by an act of 4 March 1913, provided

for the construction of a rubblemound breakwater with two arms together nearly 7,000 feet long. By 1915 the Federal project included, in addition to the breakwater, maintenance of the outer harbor to a 22-foot depth, and eventual maintenance of an inner harbor channel 20 feet deep from the outer harbor to Lake George whenever private interests completed that waterway. Indiana Harbor shared in the growth of the Chicago area and in 1914 its lake commerce included over 1.5 million tons of oil, iron, coal and lumber valued at over \$11.5 million.

Gary Harbor, Indiana

At Gary, Indiana, about 13 miles southeast from Calumet Harbor, the Indiana Steel Company constructed two piers 250 feet apart and extending some 2,000 feet into the lake to a depth of 25 feet. The work was accomplished with private funds under a War Department Permit of 1906. In 1908 a permit was obtained to construct a breakwater 3,200 feet long to protect the harbor. The breakwater was completed by 1911. The permits became necessary when a statute (364) made it unlawful to build any structure or to make any excavations or alterations in any port, roadstead, haven, harbor, or navigable river except on plans recommended by the Chief of Engineers and authorized by the Secretary of War. The United States did not assume control of the harbor and no Federal funds were appropriated for its improvement.

Michigan City Harbor, Indiana

Like Chicago, Michigan City owed its origin to its position on the lake. In the late 1840's there were large shipments of grain from the harbor and earlier manufacturing enterprises were established there because of the facilities for shipping. By 1867, according to Captain Alexander Mackenzie, "The harbor at Michigan City . . . (was) in so poor a condition that it . . . (could) hardly be called a harbor."

During the Civil War a private effort of the citizens of Michigan City resulted in the formation of the Michigan City Harbor Company with a capital stock of \$300,000 with the objective of improving the harbor. Congress gave the company authority to use the old Government piers as foundations for the improvements. When Congress appropriated \$75,000 in 1866 for further improvement, it made availability of the funds contingent upon evidence that the company had

spent at least \$100,000 on the harbor. This the company was able to show by June 1867. Government funds appropriated in 1866 and additional funds provided until 1872 were used for extending the east and west piers, repeated dredging between the piers in an effort to maintain a 12-foot depth, deepening the river and placing sheet piling on the riverbank to prevent sand being washed into the harbor.

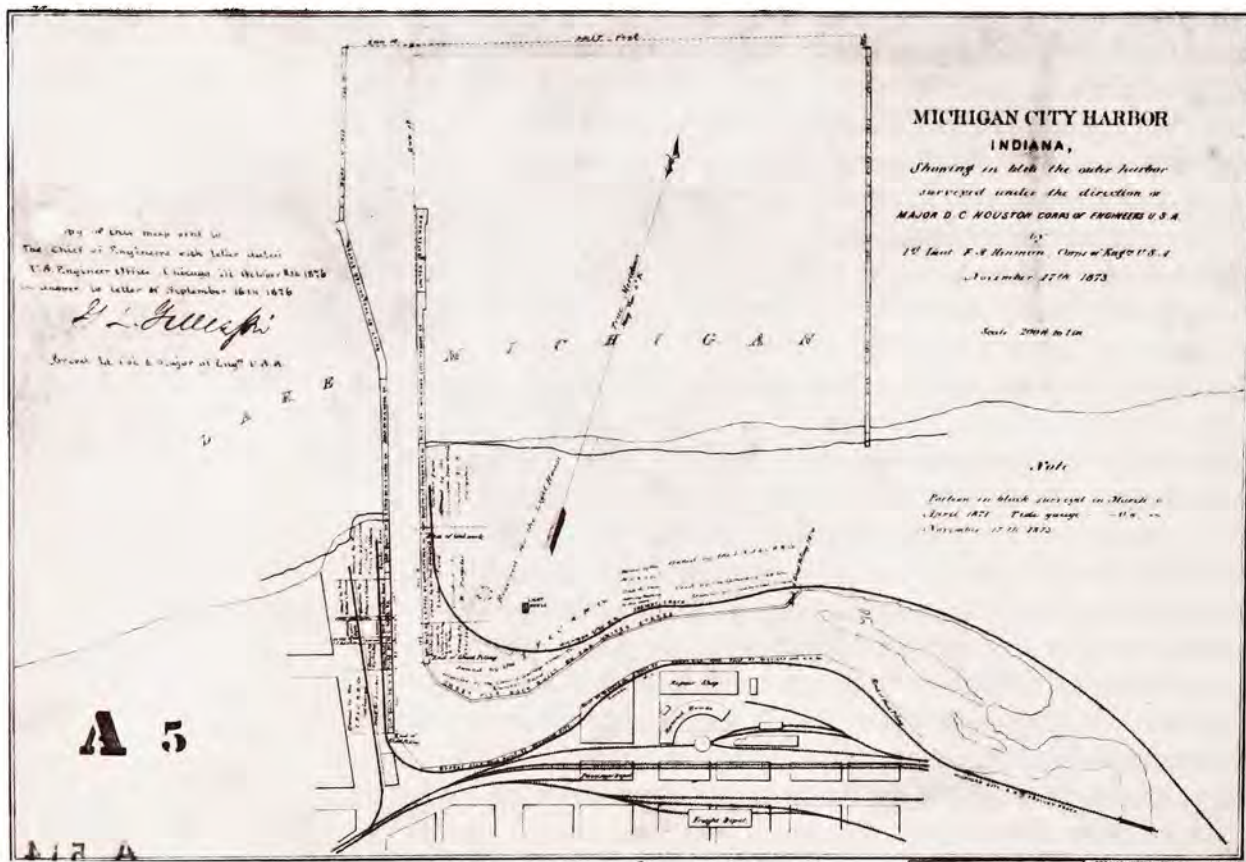
Congress was kept aware of the desire of the State of Indiana for improvement of the Michigan City Harbor by means of repeated resolutions of the State's General Assembly. On 1 February 1869, for example, the General Assembly resolved that Congress be, "respectfully requested to make such an appropriation as may be necessary to complete the harbor at Michigan City. . . ." Senators of the State were instructed and representatives requested, "To vote and use their official influence in favor of the passage of said appropriation."²¹

Major David C. Houston who was assigned responsibility for Michigan City Harbor on 3 May 1870 agreed that, "The space now afforded for vessels seeking a harbor at this point is very limited. Additional room," he added, "can be obtained either by construction of an outer harbor, or by excavating a basin above the present harbor. . . ." Furthermore, he wrote, "It seems impossible to maintain the required depth of water at the harbor, except by constant dredging. . . . It seems to constantly shoal up, and the only remedy seems to be the construction of an outer harbor."

The State Legislature sent another joint resolution to Congress in February 1871 and in 1872 Congress appropriated a larger than usual sum for Michigan City Harbor. In October 1872 work was begun on an outer harbor project. In 1882 the project was extended to include an exterior 700-foot long breakwater northwest of the entrance. Construction of the west breakwater began in 1890.

The object of the breakwater was to provide a harbor of refuge for vessels overtaken by a storm in the southeastern portion of Lake Michigan. Actually, it caused sand to accumulate in the outer harbor. "Since 1890," wrote Captain Curtis McD. Townsend in 1897, "the area available for vessels drawing 15 feet has been reduced from 40 acres to 25 acres. The area of the proposed harbor of refuge for vessels of 12-feet draft is now less than it was (before the breakwater was built) for those drawing 15 feet."²²

A special Board of Engineers studied the Michigan City Harbor in 1897 and recommended that the westward breakwater be removed and replaced by a new 1,500-foot exterior breakwater to protect the harbor from westerly storms. In addition, they said, the eastern harbor

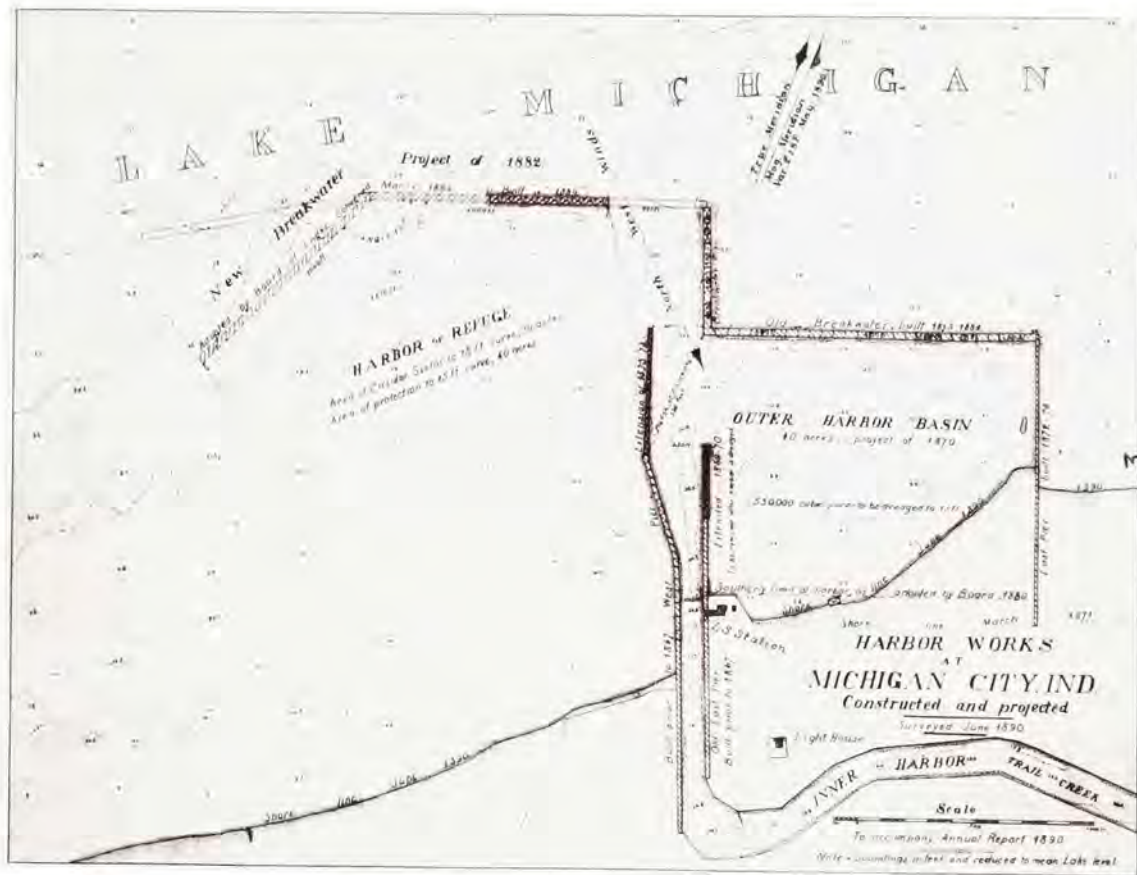


Michigan City Harbor in 1873. Since the Civil War the Federal Government had extended the piers, constructed a new east pier and revetted the entrance to Trail Creek.

pier which was already 1,225 feet in length should be extended 600 feet. The River and Harbor Act of 3 March 1899 authorized these improvements and they were completed in 1904. Between 1909 and 1911 the old west pier was removed and replaced with a new pier.

The inner harbor at Michigan City had been improved through the years by deepening the entrance through the projecting east and west piers. After 1882 the entrance channel was prolonged up Trail Creek by dredging between bank revetments built at the expense of owners of the adjoining property. As late as 1899 dredging of the inner harbor was carried out to a depth of 13 feet. In 1900 the project depth was established at 17 feet—in 1912, 18 feet. It was difficult to maintain these depths, however, and in 1916 maintenance dredging provided a channel of not more than 15 feet.

Michigan City grew from a community of 3,985 in 1870 to one of nearly 20,000 in 1910. In fiscal year 1876, 1,034 vessels with a combined tonnage of 142,105 entered and cleared the port. In 1899 there were 601 entrances and clearances with a combined tonnage of 144,000.



In 1916 there were virtually no shipments from the harbor and only 8,694 tons, mostly forest products, was received. Lake shipping no longer played an important role in the commerce of the city.

In the half century after the Civil War Congress followed a generous policy in support of lake harbors. The Federal Government carried out harbor improvements as required by the actual or foreseeable needs of private enterprise. Despite the government's willingness to improve almost any halfway favorable site, by 1916 it had become clear that a small number of harbors had out-distanced the rest and probably would grow in importance while the others declined. Among the factors which affected the growth of one harbor over another, most grew out of activity in the private economic sector over which the government exercised practically no control and included such things as the harbor's location in reference to other means of transportation, the availability of raw materials for shipment, or the presence of industry with a need for raw materials. After about 1905, to retain its importance, a harbor had to lend itself to improvement to

This drawing of the Michigan City Harbor from 1890 shows improvements there since 1873 which resulted in the creation of an outer harbor basin. The breakwater built in 1889 was later removed.

accommodate vessels of 600 feet or longer and drawing 20 feet of water.

The five decades following the Civil War were highly competitive decades characterized in the economic sphere by a drive toward combining and centralizing activity in a few large centers. This trend also contributed toward the development of a few favored and well-placed harbors over those that were more remote. If some harbor communities fossilized while others grew fat, contemporaries found it a consequence of the workings of the then popular theory of evolution whereby the unfit naturally disappeared from the competition leaving the better equipped to prosper. The following chapter tells the story of the Federal accomplishment at the numerous harbors on the western shore of Lake Michigan north of Waukegan, Illinois, and what, by 1916, had become of them.

Chapter 2



Harbors on the western shore of Lake Michigan

The history of waterborne commerce and harbor improvement on the western shore of Lake Michigan from 1866 to 1916 is a composite story shaped by the shifting fortunes of a dozen lake harbors. Activity at these harbors changed gradually as one sailed northward from Kenosha, 33 miles south of Milwaukee, to Menominee, Michigan, on the western shore of Green Bay. Kenosha County was prairie country, excellent for agriculture but with no timber. Menominee, at the mouth of the Menominee River, had a hinterland rich in timber and iron ore but with little land suitable for growing crops.

Typically, both harbors started by exporting a single item in great quantities—in the south wheat, in the north lumber, while both imported a great variety of manufactured items or products not found locally. A major import in the south was, naturally, lumber so long as it was available from Wisconsin and Michigan harbors farther to the north. Soon after the Civil War, exports from the southern harbors became more diversified and included a variety of agricultural as well as manufactured products, and imports included raw materials for manufacturing. Northern harbors such as Menominee continued primarily to export lumber, as long as timber was available, and iron ore. Since Menominee had little manufacturing beyond lumber, there were no imports of raw materials. As the turn of the century approached, Menominee began to decline as a port but was saved by the establishment of a railroad car ferry service between it and harbors on the eastern shore of Lake Michigan. Farther south exports became less

diversified after about 1900 and tended, as lake commerce generally, to consist of such bulky products as grain which lent itself to movement by water in large bulk-carrying lake freighters. Imports, to an even greater extent, became less diversified and included such bulk products as coal and cement.

Whether at pre-Civil War projects such as Kenosha, Racine, Milwaukee or Manitowoc or at ports first improved by the Federal Government after 1865 such as Menominee, Algoma, Two Rivers, Port Washington, Sheboygan, and Kewaunee, harbors were typically at the mouth of a river and were improved by constructing two parallel piers out into the lake and dredging between them. At first a depth of 12 feet was provided, then 16, and as time went on piers were extended and channels deepened until by 1916 all important harbors provided depths of 20 feet or more. In addition to piers, revetments were usually required to stabilize the channel between the landward ends of the piers and the inner harbor formed by the lower stretches of a river. Not typical were Green Bay where piers were not required and the harbor of refuge at the eastern end of the Sturgeon Bay Ship Canal. There, piers were built far apart at the shore and converged at their outer extremities to create a triangular protected area.

In the 1880's a harbor of refuge was created in Milwaukee Bay by constructing a breakwater, and in the 1890's breakwaters were provided for other harbors. After 1905 a new type of harbor was introduced which employed two breakwaters whose outer ends formed a 90 degree angle to one another and whose inner ends were connected to the shore. Also about this time timber, which had become more expensive, was no longer used for constructing or repairing harbor works. It was replaced by concrete which was not only less expensive but more permanent.

Though there was a typical development for lake harbors generally, each harbor differed from the next both in commerce and in harbor configuration. Each had its own character and history.

Kenosha Harbor

In 1870 Kenosha, at the mouth of Pike Creek, was 33 miles south of Milwaukee and 59 miles north of Chicago. Between 1866 and 1869 a navigation channel of 16 feet was established and maintained and harbor piers which had been constructed prior to the Civil War were extended and rebuilt. Wheat, an important export item before the

Civil War, became insignificant. Post-Civil War shipments included beans, cheese, eggs, butter, beef and by 1874 iron castings, leather, matches and fish. Receipts of lumber, however, increased considerably in the years following the war. By the end of the 1870's waterborne commerce about reached its height at Kenosha. Sailing vessels predominated and lumber and forest products remained the major commodity.

By 1896 the north pier at Kenosha was 1,750 feet long and projected 800 feet beyond the shoreline. The oldest part dated from 1844 and 1846 and had been extended and rebuilt on several occasions. The 1,116-foot south pier projected 920 feet beyond the shoreline. A major problem was a sandbar which repeatedly formed at the harbor entrance. In addition, in 1896, parts of the piers were dilapidated.

Local interests soon began demanding better harbor protection and increased facilities. On 3 March 1899 the harbor project was modified to include protecting the entrance with a breakwater and widening and deepening the channel to 21 feet. The 1905 Board of Engineers which studied the effect of wave action at Kenosha Harbor did not consider the commercial interests of the harbor sufficient to justify large expenditures and recommended that, for the time being, further improvement be confined to an addition of 200 feet to the landward end of the existing breakwater. Between 1908 and 1910 this recommendation was carried out and in 1916 the superstructure of the north pier was rebuilt in concrete.

After 1880 the import of lumber declined. Kenosha, which had railroad connections with the two larger harbors at Milwaukee and Chicago, did not do well as a port. For a time, when manufacturing began to flourish there in the 1890's, waterborne commerce benefited so that, by 1916, 1.2 million tons valued at close to \$13 million moved through the harbor. Unlike some lake ports, Kenosha did not become a great coal handling center. The superior harbor facilities available at nearby Milwaukee forestalled this development.

Racine Harbor

Though a small city compared to its neighbor, Milwaukee, 23 miles to the north, Racine was considerably larger than most Wisconsin lake harbors. In 1870 it already had a population of 10,000. Harbor improvements had been started there in the 1840's. In 1866 the Corps of Engineers began to increase the harbor depth to 16 feet and

extensions were made almost annually to the harbor's north and south piers. In 1867, 532 sailing vessels and 42 steamers arrived and cleared the improved harbor. Wheat was the major export item.

Although the export of wheat dropped considerably by 1873 there was a marked increase in farm products exported that year. The 250 tons of butter, 100,000 dozen eggs, and 100,000 pounds of wool exported suggest a greater diversification of farm products in the agricultural area immediately inland from the port. There was also a marked increase by 1873 of manufactured products. For example, exports included 1,200 threshing machines, 200,000 fanning mills, cultivators and reapers at a value of over \$126,000 and wool fabrics valued at \$200,000. At an early date Racine, unlike many lake ports farther north which depended almost solely on lumber, had established a broad based economy.

The citizens of Racine were careful not to be forgotten in Washington. On 22 July 1876, when it looked like Racine might be dropped from a list of appropriations, the mayor and the common council of the city wrote to the Senate and the House of Representatives to call their attention, "... to what seems to us to be an unjust and injurious discrimination against Racine Harbor. . . ." Small appropriations were made for improvements there through the 1870's and 1880's. Appropriations increased during the 1890's and culminated in a massive appropriation of \$243,000 in 1910.

Starting with two piers having modest depth between them, the nature and sequence of the improvements was typical for Lake Michigan harbors. The piers were extended and the depth increased as lake vessels grew larger. In 1889 the project depth was increased to 17 feet. By 1896 the project included a north pier, 1,760 feet, and a south pier, 1,470 feet long.

In 1899 a project was adopted that included building a 600-foot north breakwater and dredging and widening the channel to increase the depth to 21 feet. Construction of a north breakwater began in 1899. A special Board of Engineers which investigated the effect of wave action at Racine Harbor in 1905 recommended extensions to both ends of the north breakwater and a new south breakwater. An act of 2 March 1907 authorized these improvements and by 1915 extension of the north breakwater to the shore as well as removal of the greater part of the old north pier had been completed. At first, in 1909, construction of the south breakwater was postponed awaiting greater demonstration of its necessity. Its need soon became apparent and on 4 March 1915 funds were allotted for its construction. The south breakwater was not completed until later in the decade.

In 1900 Racine exported only about 5,500 tons but by 1916 exports of package freight, principally agricultural implements and other manufactured items, totaled 20,500 tons valued at \$2.7 million. Its imports in 1900 amounted to 207,000 tons of which 85,000 was coal. By 1916 coal, about 200,000 tons, was the major import item.

Milwaukee Harbor

During the Civil War Milwaukee earned the distinction of being the primary wheat market in the world. In 1862 more than 15½ million bushels of wheat were received there, more than were received that year at Chicago. The latter city, however, soon surpassed Milwaukee as a wheat market. Instead Milwaukee became a manufacturing center. The value of her manufactured products in 1869 was \$18¾ million. Products in order of their importance were flour, iron, clothing, leather and liquors. Milwaukee, for example, shipped 500,000 bushels of flour to eastern lake ports in 1872 compared with 223,000 shipped east from Chicago.

The original harbor project adopted in 1852 provided a channel 260 feet wide and 12 feet deep between two parallel piers of crib-work. In 1868 it became necessary to extend the piers into the lake to 18-foot depth of water and to increase the width at the lake end of

Milwaukee Harbor in the early 1870's at a time when Milwaukee was growing as a manufacturing center and lake boats left its wharves laden with flour, iron, clothing, leather and liquors.



Harbors on the western shore of Lake Michigan

Milwaukee in the early 1890's when the total waterborne commerce was close to 3 million tons and over 3,000 steamers and 2,000 sailing vessels arrived at the harbor annually.

the piers. The original cribs were replaced in time with more permanent materials, stone masonry, and eventually cement was used and the channel depth was increased after 1896 to 21 feet. In 1903 work was begun on a concrete superstructure for the north pier and in 1920, 14 concrete caissons totaling 570 feet were sunk in place for a new south pier. Otherwise, the project remained remarkably similar to that originally designed by Major Graham in the 1850's.

The River and Harbor Act of 14 June 1880 provided for a survey by the Corps of Engineers for a harbor of refuge in Milwaukee Bay. At this time, Major David C. Houston was in charge of harbor improvements in the Milwaukee area. The harbor of refuge was requested by the Milwaukee Chamber of Commerce which cited 41 major ship disasters in Milwaukee Bay from northeasterly gales between 1856 and 1880. Furthermore, the Chamber explained, the breakwater would eliminate the need frequently experienced elsewhere for lengthening the harbor piers and continually dredging to keep the harbor entrance clean of sand.¹

Major Houston developed a plan for the harbor of refuge, the River and Harbor Act of 1881 adopted the project and between that date and 1900 Congress appropriated \$959,000 for its construction. As





completed, the breakwater consisted of two arms. The north arm began about 600 feet from the north shore of the bay and ran southeast for 2,450 feet. From this point the main arm ran southwest for about 5,000 feet with an opening of 400 feet, 1,000 feet from the angle, to provide fair weather entrance and exit for vessels. The project was completed in 1901. In 1905 work was begun on a concrete superstructure and this work was completed in 1909.

The inner harbor which included about 20 miles of docks along the riverfront was developed and maintained by the city or by private interests. Around 1910 the people of Milwaukee began to make plans for expanding their harbor to the lakefront. The city, which grew from about 45,000 in 1870 to 285,000 in 1910, continued to grow as well as a Lake Michigan port. In 1880 its total waterborne commerce was

There was not much room for this sailing vessel to maneuver on the Milwaukee River in the 1870's. But there was an advantage to unloading cargo at the receiver's door.

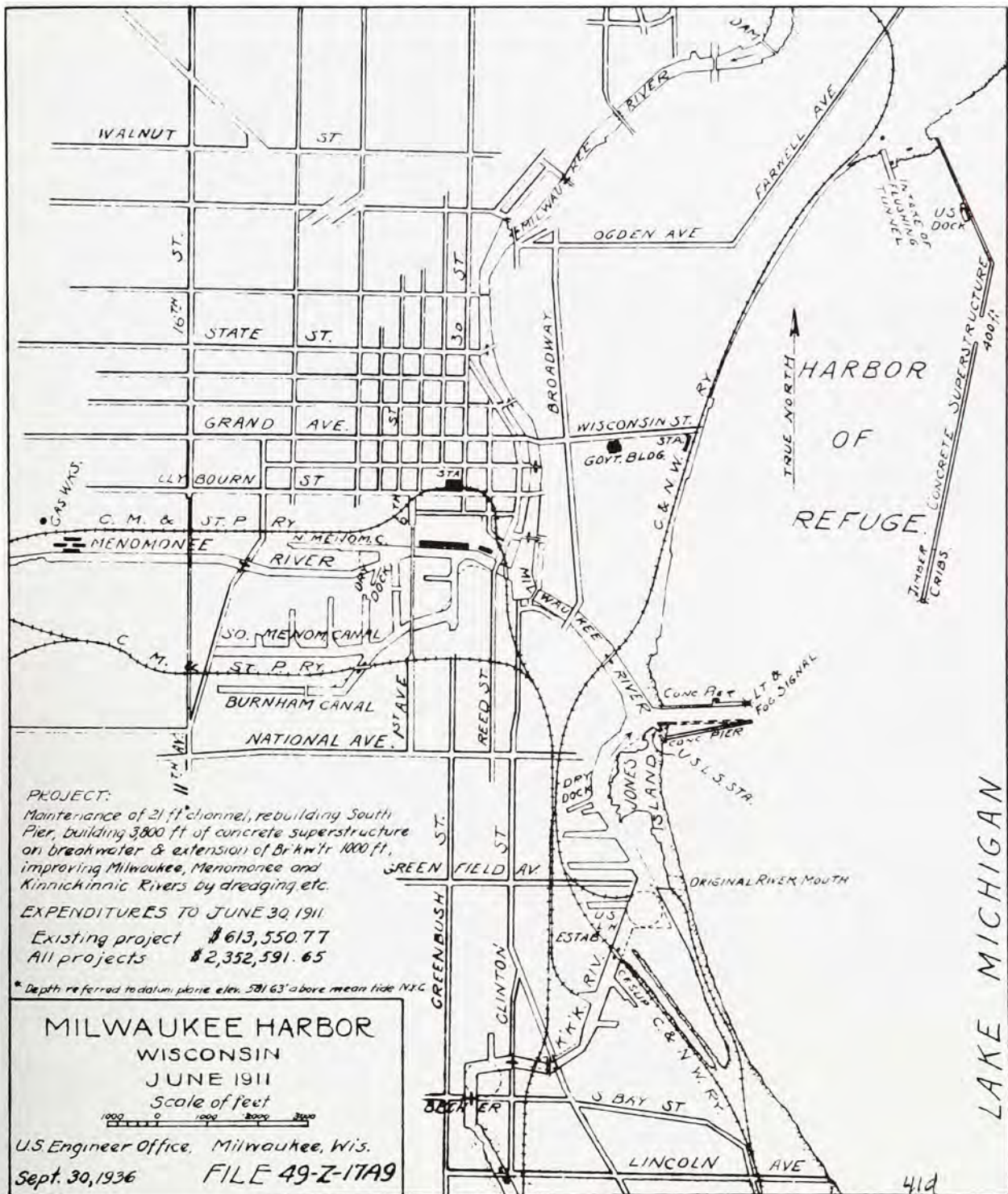
Harbors on the western shore of Lake Michigan

This placid view of the Milwaukee River from the Grand Avenue Bridge in the 1880's captures the romantic aspect of a bygone era. Actually the river was the scene of much activity for all of the harbor business was carried out in this inner harbor which was developed and maintained by the city or private interests. There were about 20 miles of docks along the river frontage.

Facing page:

This sketch of the Milwaukee Harbor in 1911 shows the completed breakwater and harbor of refuge project which had been adopted in 1881. An act of 1907 which provided for a 21-foot channel between the harbor entrance piers also provided for a 1,000-foot extension to the breakwater and the rebuilding of the south pier.





just short of 1½ million tons. In 1916 Milwaukee's total lake commerce was nearly 8 million tons.

The receipts and shipments of grains of all kinds by all means of transportation continued to increase until, by 1916, they reached a total of 86½ million bushels received and 59½ million bushels shipped. In 1913 Milwaukee was the largest coal distributing point on the Great Lakes. In that year coal receipts exceeded 5¾ million tons. Although Milwaukee received 132 million board feet of lumber in 1875, as Michigan and Wisconsin ceased to be great producers of lumber, these receipts declined and were replaced by increased receipts of cement, a development which did not reach its peak until the 1920's.

Port Washington Harbor

Port Washington, Wisconsin, is at the mouth of a small stream, the Sauk River, about midway between Sheboygan and Milwaukee. In 1870 it had a population of 2,390. Before the Federal Government began improving the harbor in the 1870's, all shipping was carried out from two privately owned bridge-type piers. An early occupation was the cutting of cordwood which was picked up from the piers by steamers and used for fuel. In addition to growing and exporting wheat, the making of barrels and the manufacture of brick from a cream-colored clay found at the mouth of the river formed the major early industries. On 9 April 1867 the Legislature of Wisconsin sent a memorial to Congress calling attention to Port Washington as a place, "... which has been neglected or overlooked and where a harbor ought to have been located long ago."²

There was no railroad at Port Washington until the Milwaukee Lakeshore and Western Railroad was completed in 1873. Prior to that date the lake provided the primary means of contact and exchange with the outside world. In 1869, 956 steamboats and propellers and 118 sailing vessels stopped at the port. Among other things they carried off over 400,000 bushels of wheat and, since building lumber was in short supply, they brought 1 million board feet of lumber.

In 1869 Major Junius B. Wheeler developed a project for a harbor improvement consisting of two parallel piers extending out into the lake to a depth of 10 feet and the excavation of a basin 600 feet long and 200 feet wide inside the shoreline. On 21 February 1870 the State Legislature again appealed to Congress for assistance, calling its



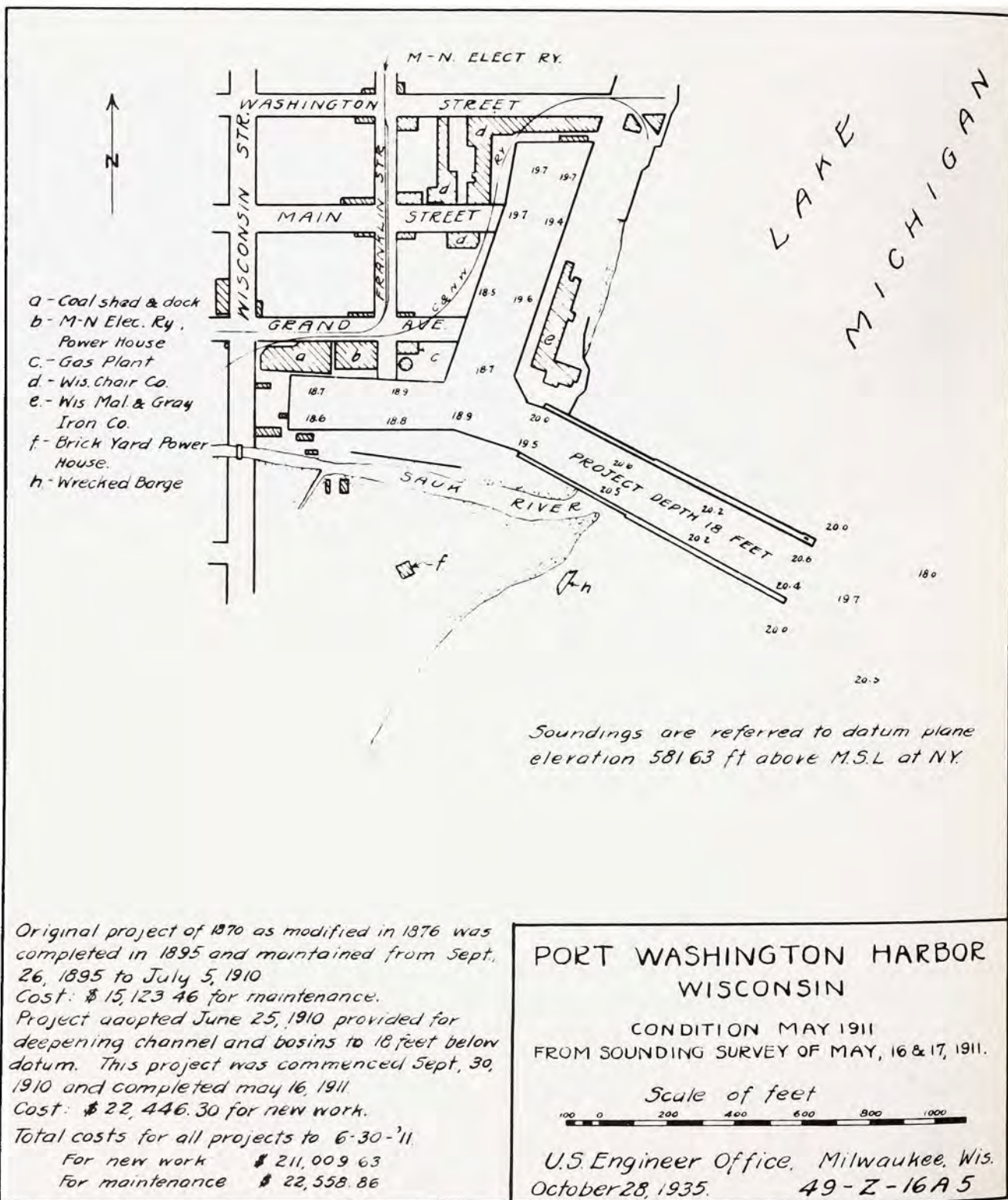
attention to the commerce at Port Washington in 1869 which was "found to have been to the amount of one million dollars." "With proper protection to vessels," the Legislature said, "commerce of said port would be at least three times what it is now."³

In 1870 Congress appropriated \$15,000 to begin Major Wheeler's project. This sum was matched by the town of Port Washington which was eager to start the improvement. The project, including a modification in 1876 to provide for a second inshore basin northward and nearly at right angles to the first and an extension of the piers to a depth of 15 feet of water, was completed in 1895.

In 1872 commerce at the port was 58,000 tons. In 1893 waterborne commerce at Port Washington reached a peak of 130,000 tons. Sixty-eight steamers and a like number of sailing vessels stopped at the harbor in that year bringing general merchandise, wheat and lumber and carrying away barley, bricks, and chairs.

In 1910 a project for deepening the channel and the basins to 18 feet was initiated. After this improvement commerce increased somewhat; still the harbor could not provide the depth or space required by the length and draft of the newer vessels. In 1908 the city received most of its coal by rail and by 1916 total shipments and receipts by water were only about 19,500 tons, consisting of exports of machinery, barley, butter, cheese and dried peas and imports of hard and soft coal and stone rubble.

This view from around 1909 of the top of one of the harbor piers at Port Washington illustrates the vulnerability of lumber in above water structures, a fault offset in the early days by the availability and low cost of this material. In 1911 the outer portions of the piers at Port Washington were renewed. In 1916 inshore sections of the piers were cut down and stone rubble superstructures put in their place.





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Sheboygan Harbor

In 1866 over a thousand vessels stopped at Sheboygan, Wisconsin, at the mouth of the Sheboygan River. In addition to general merchandise, the vessels brought lumber, nails, coal, iron and salt. A leading export was wheat—173,000 bushels in 1867, 408,000 in 1874, and 757,000 in 1875. Bricks were also an important export item, increasing from 119,000 in 1867 to 2½ million in 1875.

Improvement of the harbor was begun by the city and county of Sheboygan and consisted of north and south piers. When the Federal Government took over the improvements in 1866, the plan was to extend the piers to a 13-foot depth in the lake and to dredge between them. In 1873 and 1881 the project was modified by extending the piers still farther into the lake and dredging to a 19-foot depth at the outer end.

By 1894 the cribs of the original piers had sunk unevenly and large quantities of sand worked through them, causing an unusually large need for dredging. In 1895 a pile pier was constructed to replace the old south pier and the north pier was replaced in 1902 and 1903. In addition, a 600-foot north breakwater was constructed in 1900 and 1901. Beginning in June 1913 the breakwater was extended to the shore and portions of the north pier rendered obsolete by the breakwater were removed.

After 1902 the project called for a 21-foot depth. Total appropriations for the harbor through 1913 were about \$1,028,000. Total waterborne commerce at Sheboygan in 1916 was over \$9.5 million. Nearly \$4

This 1890 letterhead of a Sheboygan businessman shows the configuration of the harbor before it was improved beginning in 1899 with a north breakwater.

Facing page:

This 1911 sketch of Port Washington Harbor shows the interior basins and harbor piers after completion of a project in 1910 which provided for dredging so as to allow boats of deeper draft to use the harbor.

Harbors on the western shore of Lake Michigan

Manitowoc had a busy shipyard in the 1870's. This side-wheel steamer, the Muskegon, was built there in 1871.

million worth of leather was shipped. Furniture and cheese ranked next in value of exports. By far the most significant import was hard and soft coal, over 590,000 tons at a value of over \$2.5 million.

Manitowoc Harbor

Manitowoc, Wisconsin, at the mouth of the Manitowoc River, had a population of 5,168 in 1870. It was the northernmost Lake Michigan harbor which had been improved by the Federal Government during the pre-Civil War period. Some 685 vessels called on this lake port in 1866. Lumber and wood products but also quantities of agricultural products, wheat, peas, flour, cattle, butter, and nearly 2,000 half-barrels of fish were exported that year. In the 1870's, many large steamers and sailing vessels were built or repaired in the Manitowoc boatyards and drydocks. By 1876 the quantity of lumber exported dropped to 4,500,000 board feet, approximately half of the 1867 fig-





ure. Agricultural products became more significant. The quantity of wheat exported, for example, increased during the same period from 78,000 to 396,000 bushels, butter from 17,700 to 135,000 pounds.

The 1854 plan of improvement which provided for parallel piers 220 feet apart out to a lake depth of 12 feet was the basis for subsequent work on the harbor. In 1866 Major Wheeler extended the piers, and modifications in 1869, 1872 and 1881 provided for further lengthening, widening and deepening. In 1890 construction of a 400-foot exterior breakwater was proposed. The breakwater was built between 1894 and 1896 and in 1896 work was begun on establishing a 20-foot depth by extending the south pier and dredging. An act of 13 June 1902 provided for extending the breakwater, a project which

Many steamers and sailing vessels were repaired at the dry docks at Manitowoc. The propeller "Robert Holland" being repaired in this photo was built in 1872 at Marine City, Michigan.



In 1896 a railroad car ferry service was established between Ludington, Michigan, on the eastern shore of Lake Michigan, and Manitowoc. As a result the waterborne commerce passing through Manitowoc grew enormously and provided substance to the claim at the top of this 1905 post card view that Manitowoc had become "The gateway between the East and the West."

was completed in 1904. The completed breakwater protected the harbor from storms out of the northeast, but, during storms from the southeast, the extension of the breakwater reflected waves into the channel between the piers, causing destructive disturbances in the inner harbor.

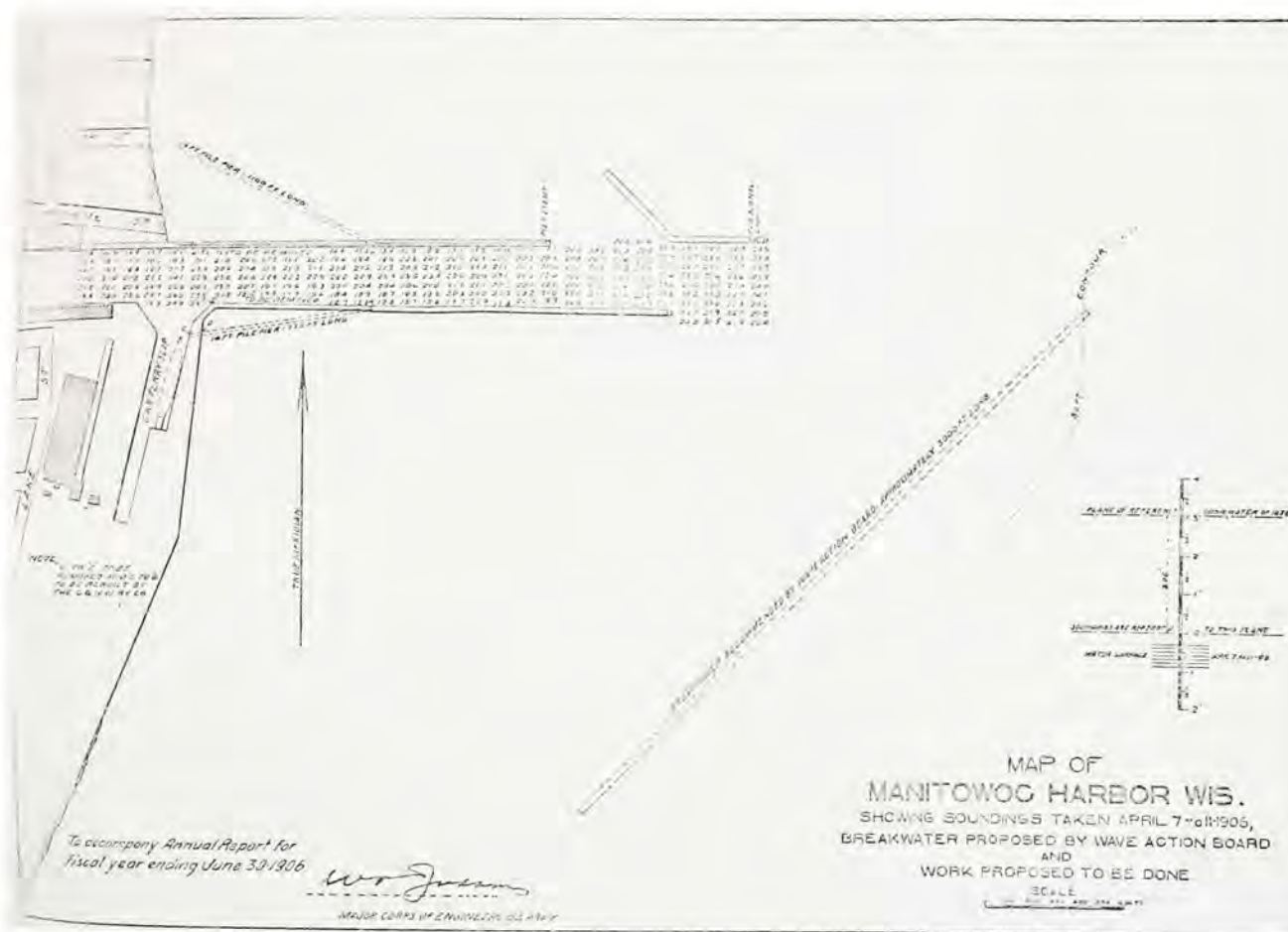
An act of 25 March 1907 provided for reconstruction of the harbor including the building of a new breakwater. Premolded concrete caissons as well as pile piers and rubble mounds were used in carrying out the project. For a time, when the project was initiated late in 1907 and in early 1908, First Lieutenant Douglas MacArthur was in charge. The project was completed in 1910.

From 1852 through 1915 the Federal Government spent about \$950,000 on the Manitowoc Harbor. This was nearly as much as had been spent on the harbors of Two Rivers, Kewaunee and Ahnapee combined. The results were also more impressive. In 1895 over 1,000 vessels used the harbor. Exports were small, primarily furniture and iron

and steel. Imports amounted to 275,000 tons of which coal and coke, marble and wood were the major items. Four years later exports had increased nearly a hundredfold to 708,000 tons while imports more than tripled to 936,000 tons. The number of vessels using the harbor had doubled to over 2,000, and the total value of waterborne commerce passing through Manitowoc was \$11.2 million. The explanation for these remarkable increases lies in the introduction around 1896 of railroad car-ferry service across Lake Michigan between Ludington, Michigan, and Manitowoc as well as Milwaukee.

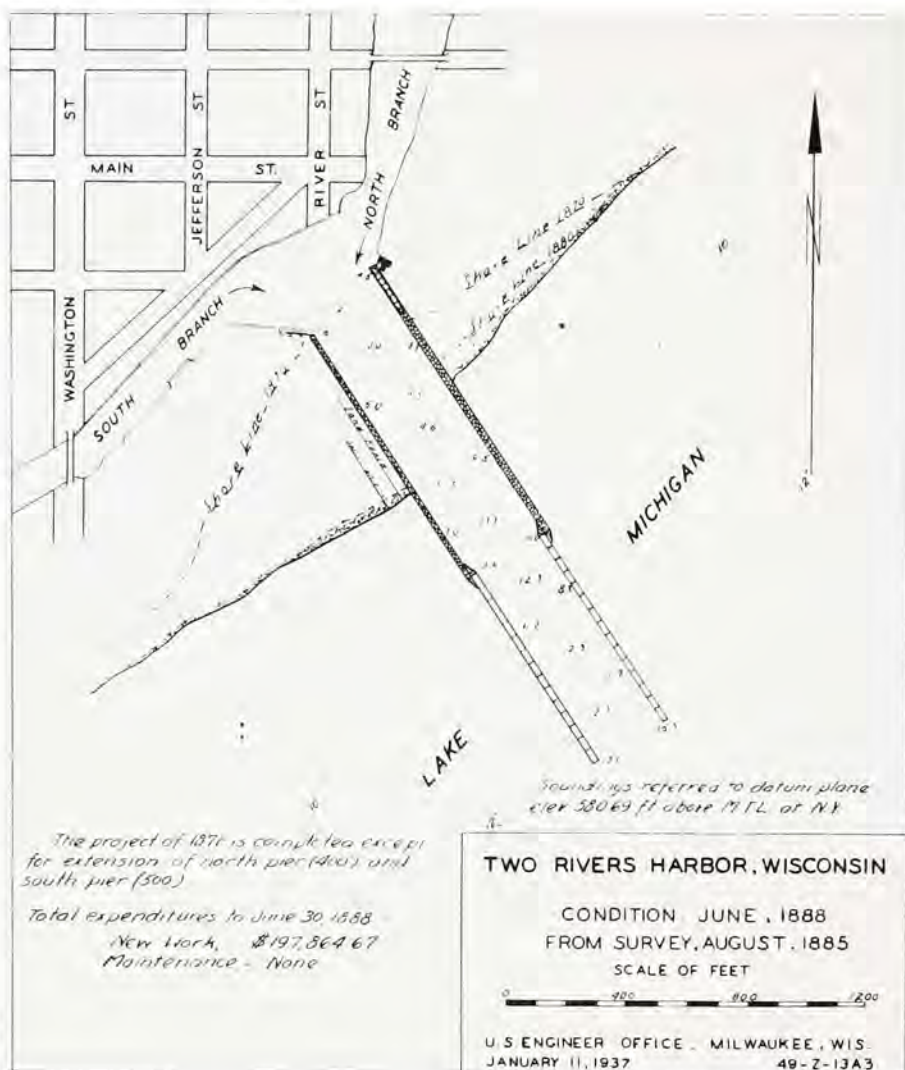
By 1915 only 1,500 vessels used the harbor, but the vessels were much larger. The total shipments and receipts exceeded 1.5 million tons and the value of waterborne commerce that year exceeded \$58.5 million. Most of this freight passed through Manitowoc without greatly affecting its economy but the city grew from a population of 5,000 in 1870 to 13,000 by 1910.

Manitowoc Harbor in 1906 showing improvements recommended by the wave action board which included construction of an outer breakwater and a realignment of the inner ends of the harbor piers so as to provide a stilling basin.



Harbors on the western shore of Lake Michigan

This 1885 sketch of Two Rivers Harbor shows the condition after the completion, except for lengthening of the piers, of the original harbor project.



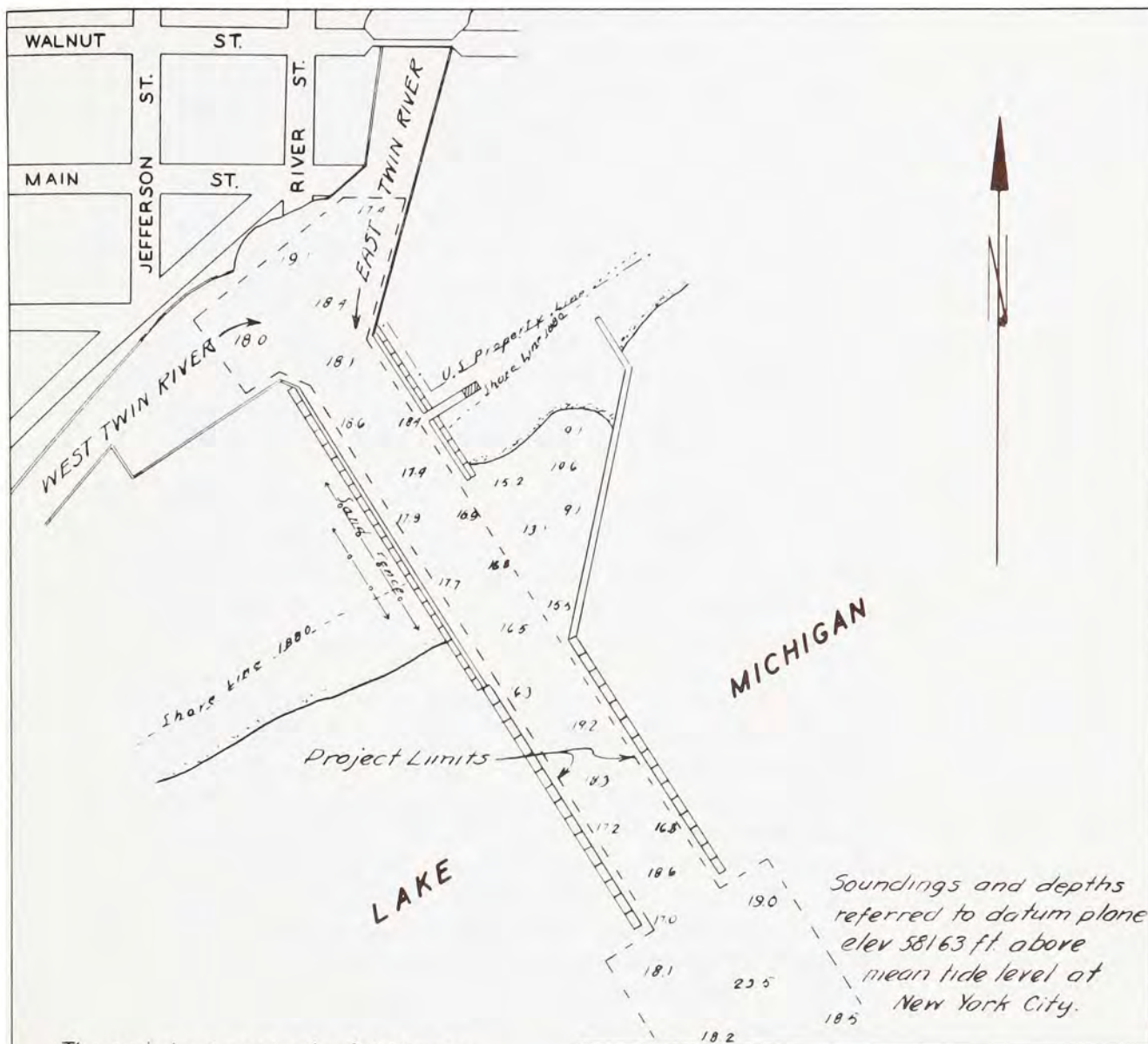
Two Rivers Harbor

Twenty-six miles south of Kewaunee, the village of Two Rivers was already, in 1870, a well-established community of 1,365 persons. There had been a sawmill at Two Rivers as early as 1830 and commercial fishing of whitefish and trout provided an excellent export item to Detroit and other eastern ports. Other industries developed including the manufacturing of woodenware as well as leather tanning which required quantities of hemlock bark.

For a time Two Rivers was the center of an active shipbuilding industry where many fine schooners were built. One such schooner, the "John Schuette," is said to have made six round trips to England.

Facing page:

Instead of lengthening the piers at Two Rivers, as provided by the original project, a modification in 1907 provided for the construction of a stilling basin on the north side of the harbor, as shown on this 1909 sketch.



The original project of 1871 was modified in 1897, by terminating the piers at the 14-foot contour, and in 1907 a further modification provided for increasing the channel depth to 16 feet and constructing a stilling basin on the north side of the harbor.

Expenditures to June 30, 1909:—

New Work	\$254,434
Maintenance	54,493
Total	\$308,927

TWO RIVERS HARBOR, WISCONSIN

CONDITION JULY, 1909
FROM SURVEY, JULY, 1909

SCALE OF FEET



U.S. ENGINEER OFFICE, MILWAUKEE, WIS.
JANUARY 12, 1937

49-Z-13A4

The village was situated at the lakeshore and straddled the two rivers from which its name was derived. Until the Federal Government began to help, the only facilities for navigation consisted of two bridge piers. In 1871 Congress appropriated \$25,000 for improvement of the harbor and work was begun that same year on construction of parallel piers reaching out into the lake from the river's mouth. The project was not pushed to rapid completion since, in 1874, a railroad connection was made to the city and the needs of water commerce seemed less urgent. Nevertheless, by 1885 a satisfactory entrance channel of 12-foot depth was completed.

In 1897 the original project was modified and the piers were terminated in the lake at a depth of 14 feet. In 1907 a further modification to the 1871 project provided for increasing the channel depth to 16 feet and for construction of a stilling basin on the north side of the harbor.

In 1876 some 300 steam and 90 sailing vessels used the Two Rivers Harbor. The vessels brought 8,010 tons of general merchandise, 6,000 tons of which was bark for use in the tanning industry. Exported items included chairs, doors, blinds and sash, empty barrels, fresh fish, furniture, woodenware and other products. Total commerce was 63,000 tons.

In 1894 total waterborne commerce reached a peak of 102,000 tons with an approximate value of \$5½ million. Nearly 10,000 tons of furniture was shipped, while hay and fish remained important export items. Saw logs, coal and coke were major imports followed by wood, lumber and stone. By 1915 total waterborne commerce dropped to only 47,897 tons. The only items shipped were hay and oats while some 30,000 tons of coal still came to the city by water. Total value of waterborne commerce that year was only \$199,000. By 1915 and thereafter, except for coal, the principal industries at Two Rivers carried on most of their commerce by rail.

Kewaunee Harbor

Just 12 miles south of Ahnapee at the mouth of a small river, the town of Kewaunee had a population in 1873 of 1,200 to 1,400. The small port there had a north pier which was the property of a sawmill and a south pier which was used to moor steamers when the lake was calm. In the 1870's household goods and general merchandise were brought to Kewaunee by lake vessel. Some \$250,000 in wood products,

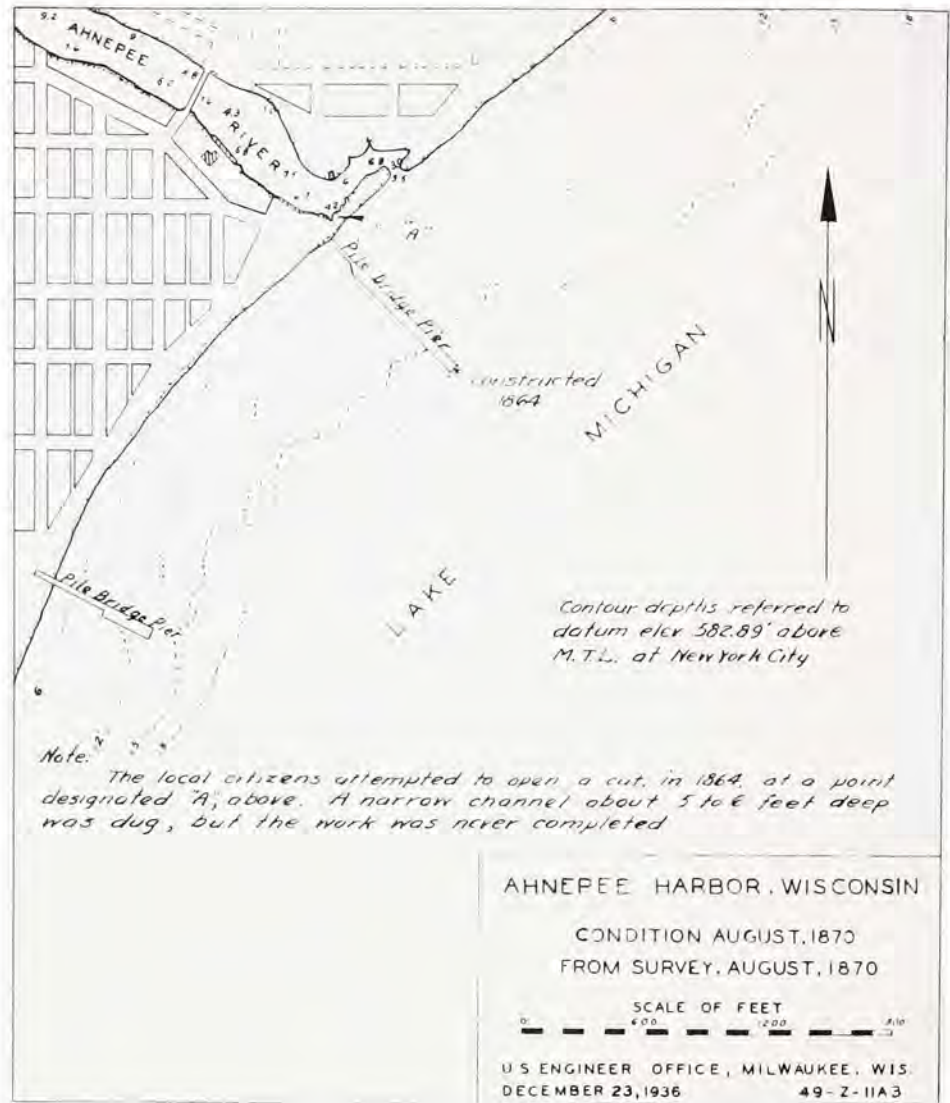
railroad ties, fence posts, lumber, shingles, etc., and \$13,000 in flour were exported from the small port in 1872. The river was used primarily to float logs to the downstream mill. The timber adjacent to the river was nearly exhausted and in 1873 it was anticipated that in 3 years the mill would shut down. Major David Crawford Houston recommended that, "... it would seem more judicious to appropriate money for the completion of other harbors on the lake so as to make them available for the general security of navigation than to undertake new work at Kewaunee Harbor where it is not imperatively demanded."⁴

On 9 March 1874 the Legislature of Wisconsin sent a memorial to Congress respectfully asking, "... that your honorable body make an appropriation sufficient to commence the construction of said harbor at Kewaunee." (House Misc. Document 176/43/1.) Congress did not react until, in the River and Harbor Act of 14 June 1880, provision was made for the survey of the Kewaunee Harbor. The responsible engineer, Major Henry M. Robert, was also asked to work with the town engineer and advise on the expenditure of \$8,000 raised through taxes by the town to commence the improvement. Major Robert advised the town to purchase oak timber and stone since these at least would not deteriorate while waiting for a congressional appropriation. Congress responded quickly, however, and in 1882 appropriated \$12,000 to begin work on the project.

Major Robert's plan included cutting a channel 15 feet deep through a neck of land between the river and lake at a point just 2,000 feet south of the river's mouth. The channel was to be continued out into the deep water of the lake and two parallel piers were to extend on each side of the cut out to 19-foot lake depths. The piers were completed in 1897 and the dredging in 1898. The River and Harbor Act of 1899 initiated a survey with a view to making Kewaunee a harbor of refuge and an act of 25 June 1910 provided for increasing the channel depth to 20 feet as well as for a turning basin.

By 1900 shipments and receipts by way of the Kewaunee Harbor exceeded ½ million tons and had an approximate value of near \$7 million. Mill stuffs and flour were the most significant export items while coal and coke made up the bulk of imports. Tonwise, by 1916, commerce had dropped considerably to just under 200,000 tons. However, in terms of value, water commerce had increased to nearly \$8½ million. Corn and rye remained important export items while agricultural implements, mining machinery and manufactured iron brought to Kewaunee by car-ferry were the most significant imports.

Harbors on the western shore of Lake Michigan

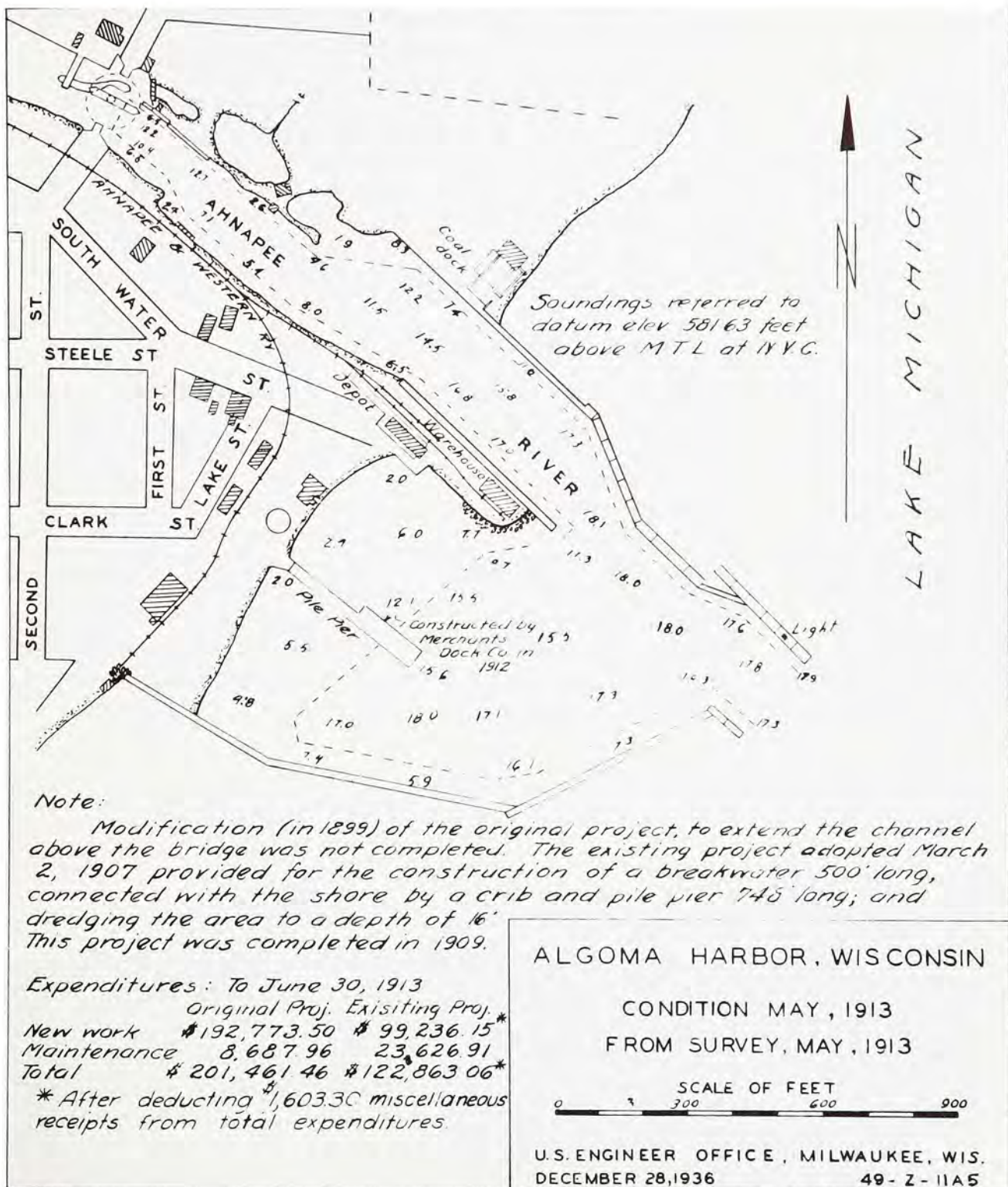


At the time this sketch of Algoma Harbor was made in 1870 the city was still called Ahnapee. The bridge piers shown here were privately owned, a condition which led the local citizens to petition for harbor improvement by the Federal Government.

Algoma Harbor

Facing page:
By 1913 Algoma had a fair amount of commerce flowing through its port. A Federal project providing a breakwater connected to the shore by a crib and pile pier was completed in 1909.

The construction of a harbor of refuge at the east end of the Sturgeon Bay and Lake Michigan Ship Canal made less vital a similar harbor planned in 1870 at the less favorable location of Algoma (until 1897, Ahnapee) on the Wolf River. Algoma is on the west shore of Lake Michigan about 15 miles south of the eastern end of the Sturgeon Bay and Lake Michigan Ship Canal. Around 1870 the town had some 1,500 residents, 2 flour mills, 4 sawmills, a chair factory, a brickyard, 3 tanneries, a brewery, a shipyard and a shingle mill. These industries



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The harbor of refuge provided essential protection to the Lake Michigan entrance to the Sturgeon Bay and Lake Michigan Ship Canal.

This view of the harbor piers at the Lake Michigan entrance to the Sturgeon Bay Ship Canal during construction in the late 1870's is a rare but deceptive photograph. The piers were 850 feet apart at the shoreline. To get both piers on one photo the photographer took two shots and pasted them together.

were held back by the lack of harbor facilities. The only facility available was a privately owned pier charging exorbitant fees.

Congress appropriated \$50,000 in 1871 and 1872 to begin construction of an outer harbor of refuge to consist of two parallel piers at the mouth of the river. In 1892 the Ahnapee and Western Railway established a connection from Algoma to Green Bay and commerce through the harbor began to decline soon thereafter. The construction during 1908 and 1909 of a breakwater and outer harbor on the south side of the harbor entrance as provided by the River and Harbor Act of 2 March 1907 did not reverse this downward trend.

Sturgeon Bay Harbor of Refuge

In 1873 Congress appropriated \$40,000 for a harbor of refuge on the Lake Michigan side of the 70-mile long narrow peninsula which separates Green Bay from Lake Michigan. The harbor was located at the eastern end of the Sturgeon Bay and Lake Michigan Ship Canal which was built by a private corporation between 1872 and 1881. The canal will be discussed in a subsequent chapter. The harbor of refuge was atypical for Lake Michigan harbors at this time in that it was constructed of two 1,200-foot long piers which, instead of running parallel into the lake, were built 850 feet apart at the shoreline and converged so that at their outer ends they were 250 feet apart. The 10-acre triangular area thus inclosed was dredged from time to time to meet the requirements of navigation.

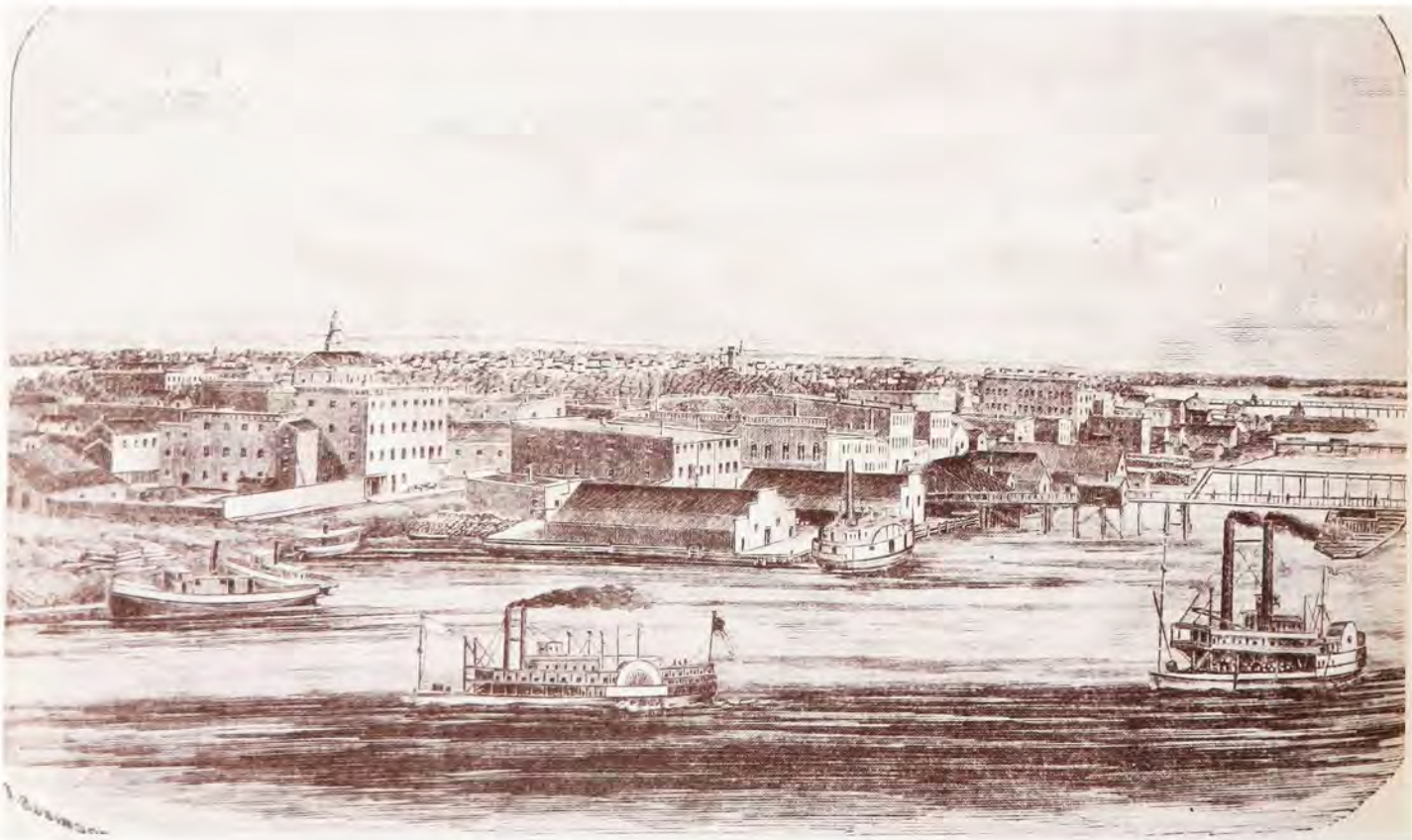


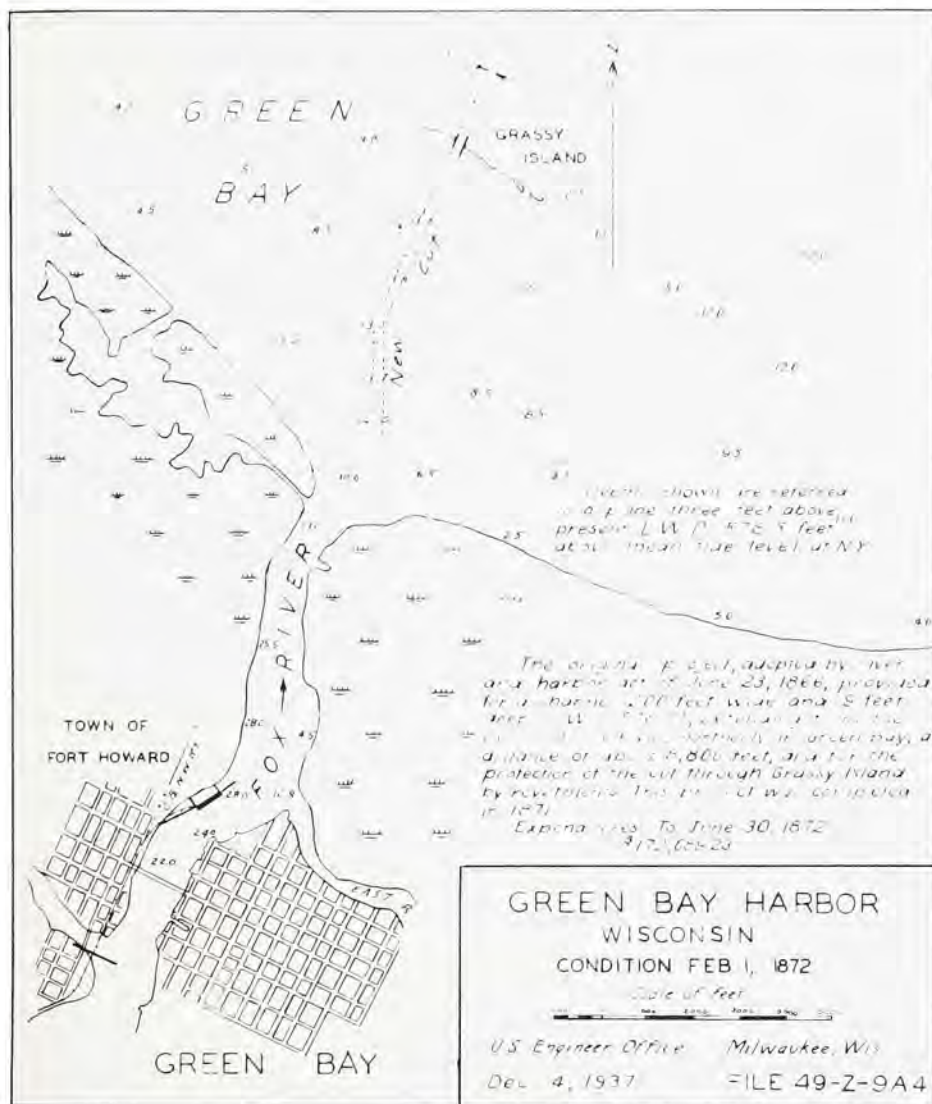
Harbors on the western shore of Lake Michigan

Green Bay Harbor

Long before Milwaukee became a significant port, the harbor at the city of Green Bay located at the mouth of the Fox River at the head of Green Bay attracted lake mariners. Out in the bay about 1½ miles from the mouth of the Fox River there was in 1866 an island, called Grassy Island, which blocked the entrance to the harbor. The channel around the island is said to have been intricate and tortuous; its depth was around 11 feet. Nevertheless, more than 500 steamers and sailing vessels made their way to Green Bay Harbor in the year ending 30 July 1866. This was enough to justify consideration from Congress which, in the River and Harbor Act of 23 June 1866, appropriated \$30,000 to begin dredging a channel 200 feet wide and 13 feet deep from the mouth of the Fox River straight through Grassy Island and sufficiently far into Green Bay to reach a natural depth of 13 feet. In 1867 the cut was dredged through Grassy Island under the direction of Major Junius B. Wheeler and in 1871, at a time Major David C. Houston was in charge, the project was completed.

A view of Green Bay City in 1876 when lumber and other forest products were the major items carried off in the holds of the 300 steam and 90 sail vessels that called it the harbor that year.





This 1872 sketch of the Green Bay Harbor shows the harbor after completion of the original project there which provided for the dredging of an outer channel 200 feet wide, 9 feet deep, and 8,800 feet long. The 650-foot cut through Grassy Island required revetting to hold the banks in place.

Six hundred and seventy-seven sail vessels and steamers called at Green Bay Harbor in the year ending 1867. They brought varied cargoes including tea, tobacco, fruit, coffee, crackers, sugar, and molasses, but also such items as stoves, 140 tons of them, and 700 tons of coal. In all 172,500 tons were shipped including in order of importance lumber, flour, meal and feed.

After 1872 dredging was carried out in the channel or river's mouth almost every year. As at all projects during this period, the primary concern in respect to dumping the dredged earth and sand was that this be done at sufficient distance from the channel so as not

to interfere with navigation. Much of this dredging was maintenance but in 1874 the project was revised to provide for a 15-foot depth and the length of the channel was extended to 11,600 feet.

The River and Harbor Act of 13 June 1902 authorized deepening the outer channel at Green Bay Harbor to 20 feet. This work was accomplished in 1903. Maintenance dredging and the dredging of a turning basin for the inner channel at DePere on the Fox River about 7 miles from the mouth was carried out in the year immediately following. In 1907 First Lieutenant Douglas MacArthur assisted Major William V. Judson, District Engineer of the Milwaukee District (1905-1909), in carrying out Corps of Engineers responsibilities at Green Bay and other Lake Michigan ports.

After 1877, when a total of 146,260 tons of lumber and forest products was shipped from Green Bay, lumber decreased in importance to be replaced by shipments of grain and flour. In the 1880's Green Bay was the largest flour shipping port on the Great Lakes. The harvests from grain fields of Wisconsin and Minnesota found their way to Green Bay by means of the Green Bay and Western Railroad. By 1899, 55 percent of all shipments from Green Bay was grain, over 4 million bushels, mill stuffs and flour.

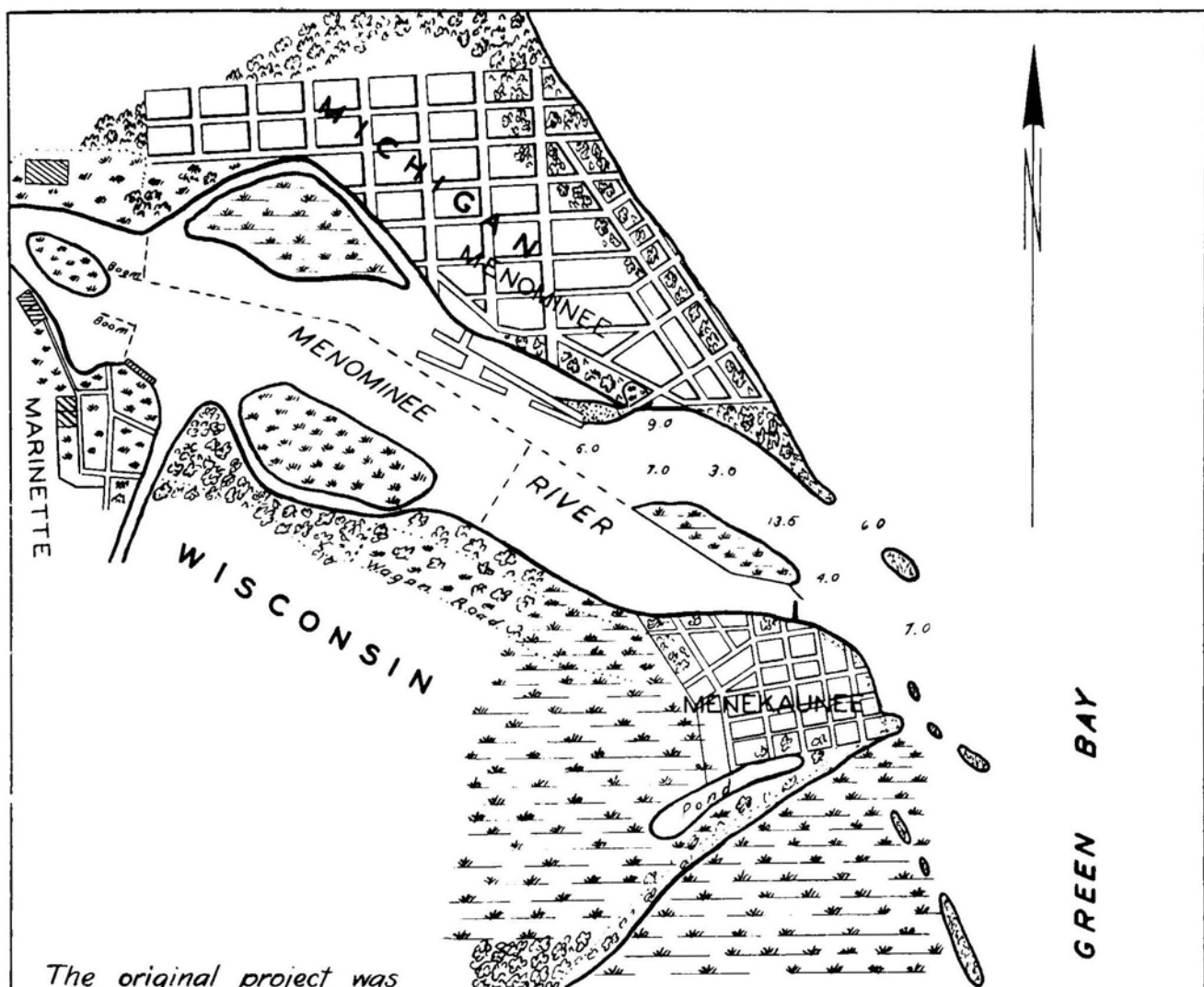
Coal, meanwhile, became the most significant cargo received. In 1909 the 466,000 tons of coal received constituted 75 percent of the year's receipts. By comparison receipts of gasoline, kerosene and fuel were small in 1911 but became more significant at a later date. Green Bay, which had a population of 4,666 in 1870, grew to over 25,000 by 1910.

Menominee Harbor, Michigan

A number of smaller communities on Green Bay shared the logging boom of the 1860's with the city of Green Bay. These small ports were frequented by a large fleet of vessels engaged in carrying lumber. In 1867 some 565 million feet of lumber valued at over \$6,700,000 was shipped from Green Bay ports to such harbors as Chicago and Milwaukee. By 1871 the value of these exports was estimated at \$65 million. Forest products remained the major export item, but there were other exports as well such as fish, pig iron and iron ore.

On the banks of the Menominee River, which for 118 miles forms the boundary between the States of Wisconsin and Michigan, there were large tracts of pine lands and extensive deposits of iron ore. The

Facing page:
When this sketch of the
Menominee harbor was
made in 1867 boats were
loaded from scows
hauled out on lines made
fast to the shore and to
the anchored boats.



The original project was adopted by the R. & H. Act of March 3, 1871, and provided for two parallel piers, about 400' apart, extending to the 15' contour in Green Bay. Work was begun by contract June 30, 1871. Soundings are believed to refer to the surface of the water. The mean level of Lake Michigan for July, 1867 was 582.1 feet above mean tide at New York.

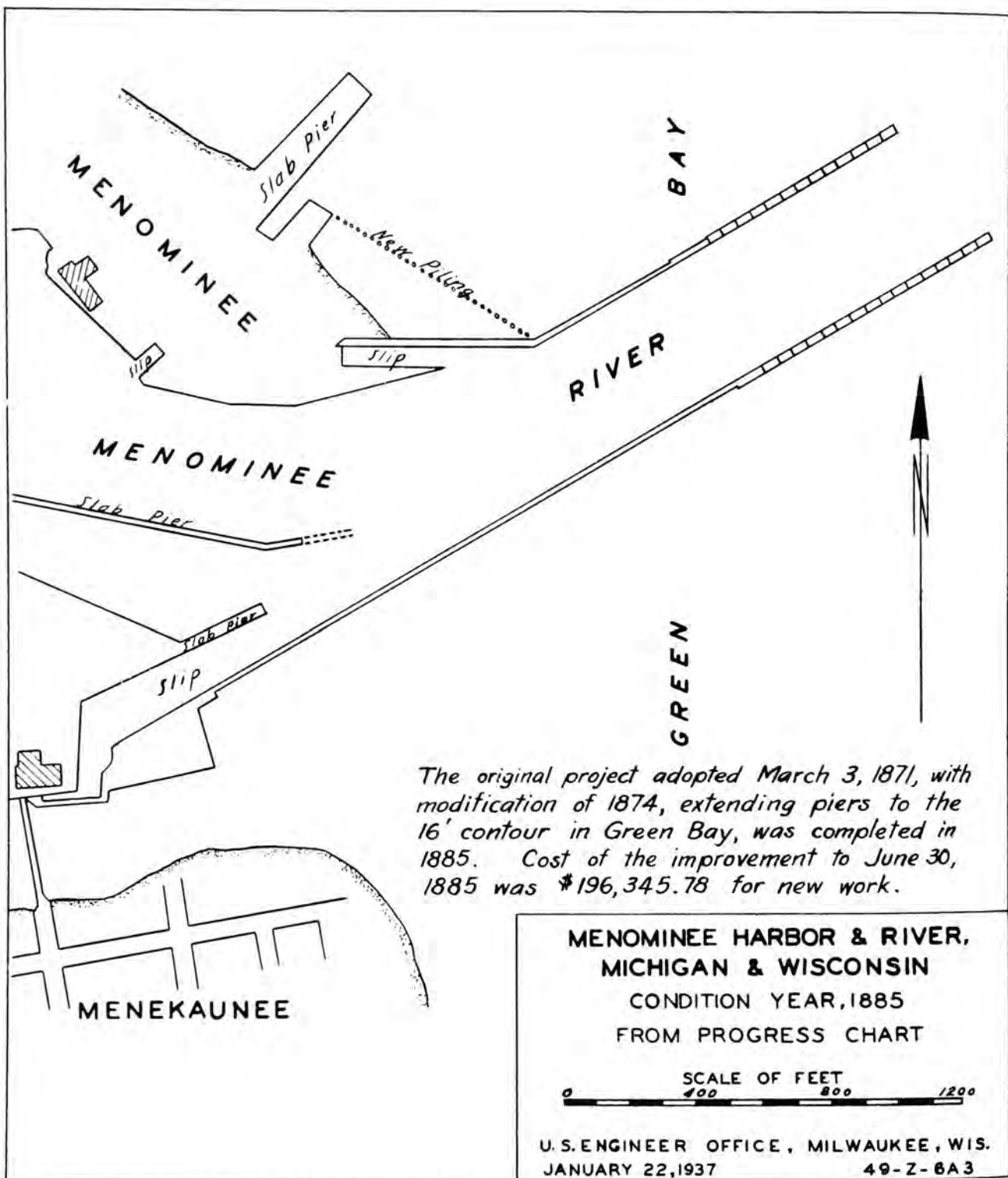
MENOMINEE HARBOR & RIVER, MICHIGAN & WISCONSIN

CONDITION JULY, 1867
FROM SURVEY, JULY, 1867

SCALE OF FEET



U.S. ENGINEER OFFICE, MILWAUKEE, WIS.
JANUARY 21, 1937 49-Z-6A2



town of Menominee, Michigan, at the mouth of the Menominee River and about 50 miles from the city of Green Bay, provided one of the few points on the west shore of Green Bay with a potential for development into a harbor of refuge for the lumber fleets. In 1867 over 400 large sailing vessels and 175 steamers put in there. Menominee already had a post office, 2 hotels, a printing office, 10 steam sawmills, and a population of about 3,000.

The first survey of the Menominee Harbor was carried out by Major Junius B. Wheeler in 1867. At that time there was only about 6 feet of water over the bar at the mouth of the river. Boats were anchored outside the harbor and loaded from scows hauled out on lines made fast to the shore and to the anchored boats.

Harbor improvement was begun in 1871 under the direction of Major David C. Houston and involved construction of 2 parallel piers 400 feet apart from the mouth of the river into the bay to a depth of 15 feet and dredging between the piers to maintain a 14-foot navigation channel. The piers were extended from time to time. In 1891 dredging was carried out to secure a 16-foot depth and from 1899 to 1902 the river and harbor were dredged to obtain a 20-foot depth. After that and until 1916 the work was confined only to maintenance dredging and to repairing and rebuilding the piers and their superstructure.

In the early years, when commerce consisted largely of lumber and forest products, shipments greatly exceeded receipts. In 1874, for example, shipments were 15 times as large as receipts and forest products accounted for about 98 percent of the total shipments. In the 20 years, 1874-1894, total commerce increased about 4 times. Lumber and forest products continued to account for 90 percent of the total traffic. However, in 1894 a line of car-ferrying steamers, each capable of carrying 24 loaded railway cars, began operating by means of the Sturgeon Bay and Lake Michigan Ship Canal between Frankfort, Michigan, and Menominee. The car-ferry line helped to increase the receipts of the port until, by 1904, receipts and shipments were about balanced. Still, total commerce began to fall off after 1894 when shipments of lumber began to decrease. In 1916 total commerce was about 482,000 tons valued at about \$10,742,000. By 1910 Menominee had a population of 10,507, about 2,000 less than in 1900. After the departure of lumbering, manufacturing did not fill the gap as rapidly as it did at such other ports as Green Bay, Racine or Kenosha which were nearer to centers of population.

Facing page:
The Federal project at Menominee included the construction of two piers from the river's mouth to a depth of 16 feet in Green Bay. This sketch shows the original project as completed in 1885.



Disposal of Dredgings

A line of car ferrying steamers, each having a capacity for 24 loaded railway cars, began operating in July 1894 between Menominee and Frankfort, Michigan. Heavy ice in Green Bay such as shown here being broken by the Ann Arbor No. 3, a car ferry, defeated an attempt to operate the line during the winter.

Several lake harbor related developments in the final decades of the 1866-1916 period deserve special emphasis because they were remarkable in themselves or because they throw light on subsequent events.

Beginning in the 1960's a growing concern of the public for the natural environment led to close inspection and sometimes criticism of Corps of Engineers practices relative to the disposal of material dredged from Great Lakes harbors. These practices originated in the 19th century when the primary concern was that dredged material be placed where it would not interfere with the movement of lake vessels through navigation channels which had been provided at no little expense by the American taxpayer.

Dredgings were used from time to time to fill dikes, to reclaim land or to create artificial islands but usually they were taken out and dropped in deep water of the lake. The practice was not a haphazard one. In 1899, for example, after consultation and agreement with local authorities limits for the lawful depositing of dredged material in deep water of the lake in the vicinities of Two Rivers, Sheboygan, Milwaukee, Kenosha and Racine were defined and then approved by the Secretary of War.⁵ At Chicago a similar agreement was reached in 1899 but the city, out of concern for its water supply, changed its mind and in 1901 a new area was defined somewhat farther from shore. Thereafter, for more than 50 years, depositing of dredged material in officially designated areas of Lake Michigan was a routine operation which excited little comment.

Arrowhead Harbors

In 1905 a specially appointed Board of Engineers studied the injurious effects of wave action in inner harbors at Ludington, Michigan, and at Manitowoc, Two Rivers, Racine, Kenosha, and Sheboygan, Wisconsin. The problem of wave action became acute when the harbors were deepened to 21 feet. The board found that during storms the maximum height of waves at these harbors measured from 10 to 15 feet from hollow to crest and that, "During severe storms these waves roll into the harbor and when there is no interior basin in which to expand, run up the bulkheaded and gradually narrowing channel causing, in some cases, inconvenience to vessels lying alongside the docks." In addition, the piston-like action of the waves at the entrance channels pounded quantities of water into the inner harbors which, when the waves abated briefly, rushed lakeward again with considerable velocity. This undertow, as it was called, caused as much damage and inconvenience as the waves themselves.

Since the inner harbors lacked space to deal with the problem the board recommended the construction of artificial outer harbors formed of two breakwaters whose outer ends made an angle of 90 degrees with one another and whose inner ends turned at right angles to the shoreline. The result was a harbor configuration resembling an arrowhead. Breakwaters of this type, the board believed, would permit waves entering between their outer ends to expand within the inclosed area so that by the time they reached the inner piers they would cause little inconvenience.⁶

Specially appointed boards such as this one, established for a

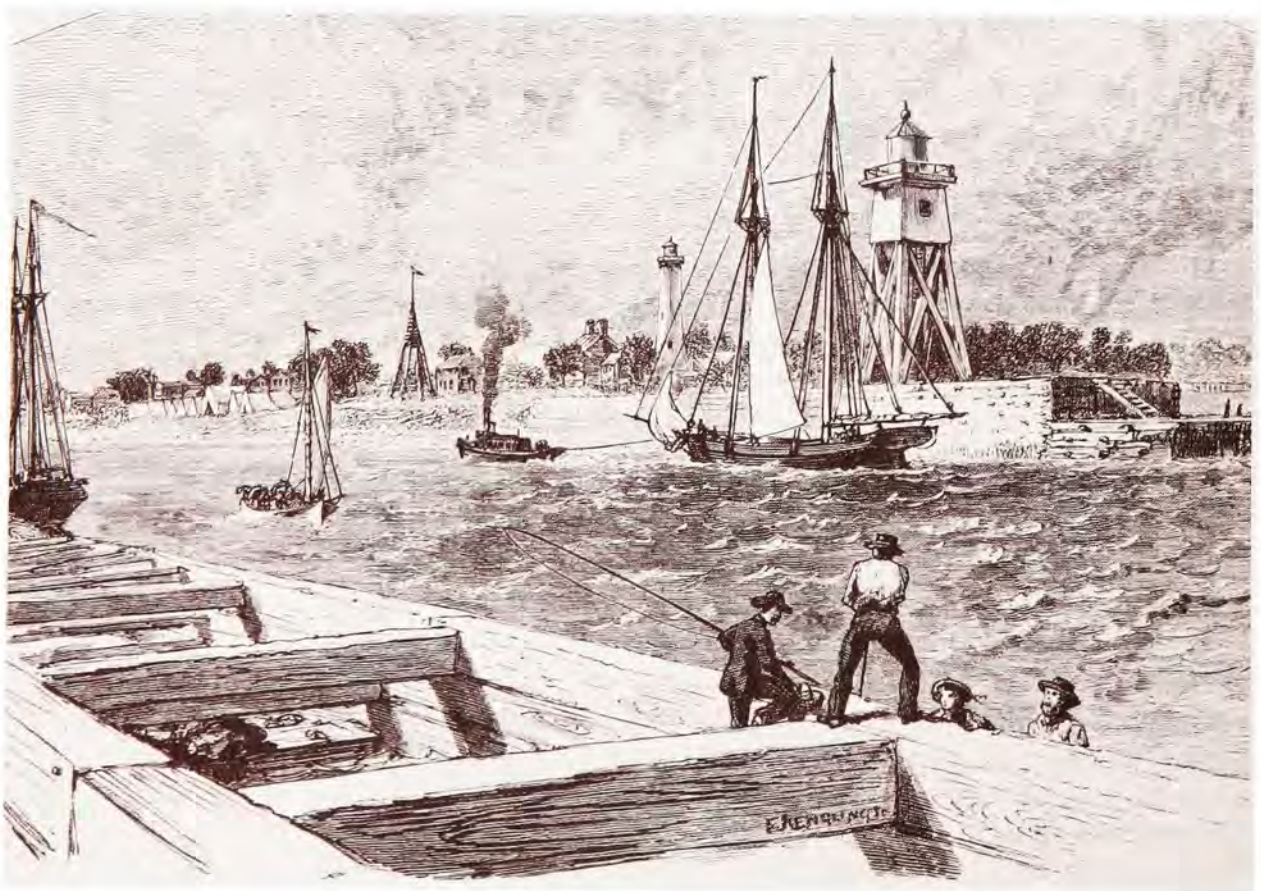
Harbors on the western shore of Lake Michigan

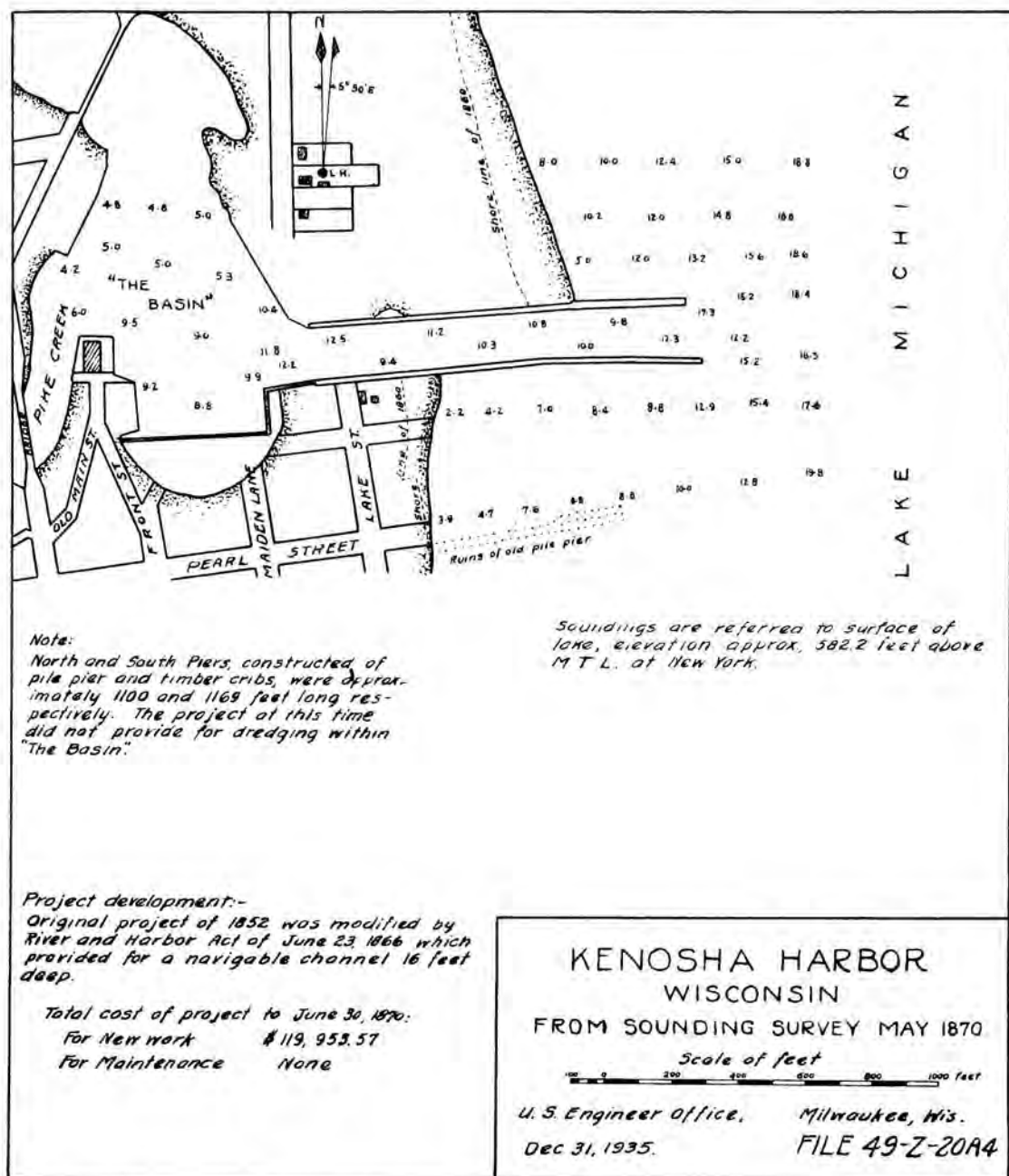
Between 1866 and 1869 the harbor piers at Kenosha were extended and rebuilt. This drawing from 1871 shows how the pier structures looked to one contemporary observer.

special purpose and then disbanded, had been common since 1831. In 1880, to avoid the necessity of constituting them, the permanent Board of Engineers for Fortifications was reorganized to include consideration of plans for river and harbor improvements. In 1902, however, a permanent Board of Engineers for Rivers and Harbors was created which was to consider these projects. Still, special boards continued to be appointed from time to time to review specific projects or problems.

Reinforced Concrete Caissons

A development in the Milwaukee District whereby premolded reinforced concrete boxes called caissons were used instead of timber cribs filled with stone or rubble mounds for breakwater construction began with the obtaining in 1901 by Corps of Engineers officer, Captain William V. Judson, of a patent for design of the caissons. Captain Judson licensed the United States Government free use of his design.

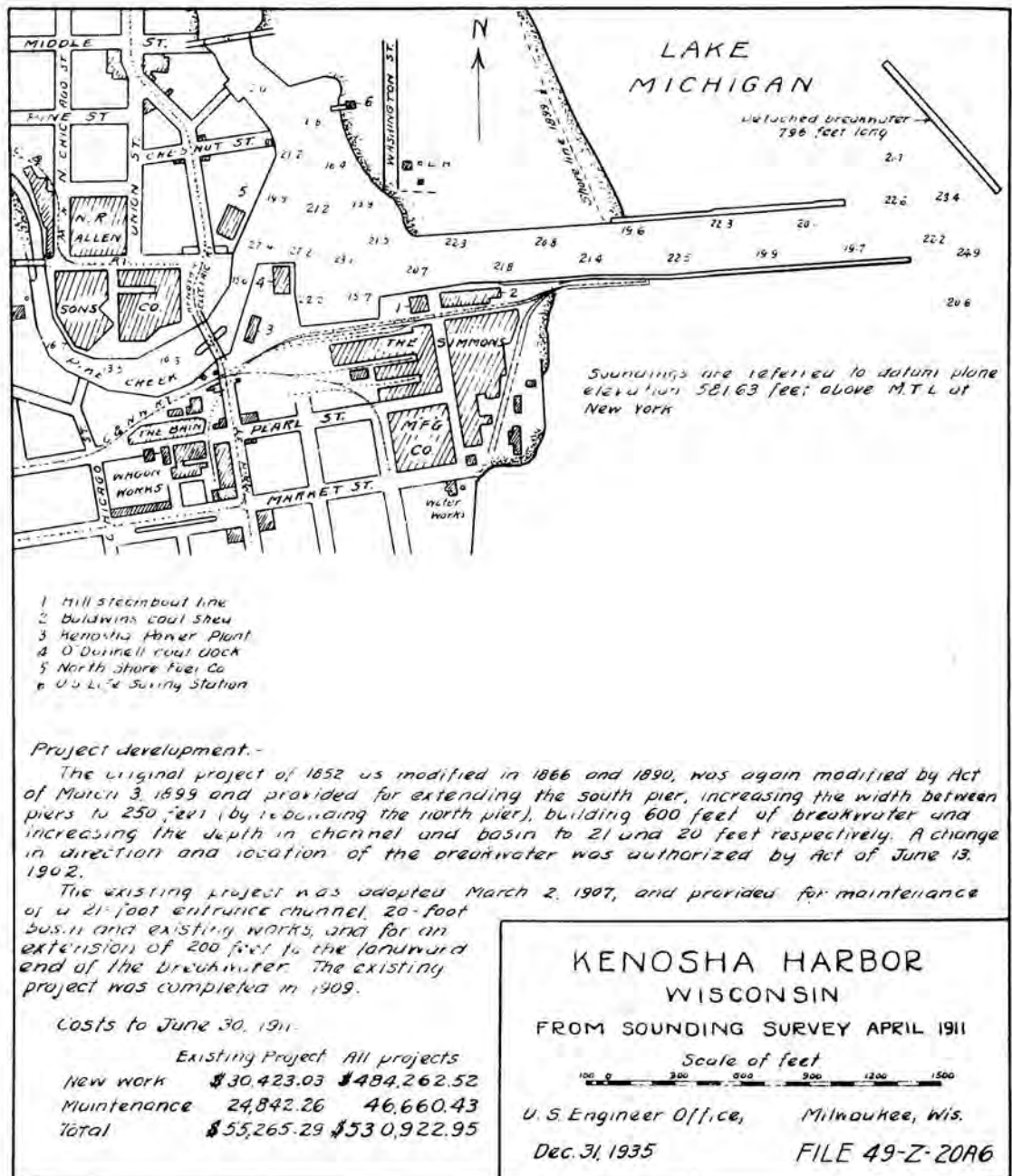




He subsequently built and used the caissons in breakwater construction while District Engineer from July 1905 to March 1909.

Caissons of iron filled with cement were constructed experimentally in Europe prior to 1905 but it was Captain Judson who is credited with building the first practical reinforced concrete caisson in 1908. This first caisson was hollow but divided into cells and open at the top. It was

This 1870 sounding survey sketch of Kenosha Harbor shows improvements which had taken place since 1844.



This sketch of Kenosha Harbor from 1911 shows the breakwater which had been completed in 1910.

24 feet long and rectangular. Later developments led to caissons 54 feet long, 10 feet wide at the top, 18 to 21 feet high, and with side slopes of 3 vertical to 1 horizontal.

The caissons were built on land with hired labor at a Government plant inside Milwaukee Bay, launched, decked over to prevent swamping and then towed two at a time to the harbor at which they

were to be used. There they were sunk in place by letting in water. If, for some reason, a caisson sank unevenly the water could be pumped out and the process repeated. Once the caissons were permanently in place, they were filled with stone. By 1920, 144 caissons had been built and put in place at harbors on the western shore of Lake Michigan and others were under construction for harbors on the eastern shore. They were less expensive in first cost than timber crib structures or rubble mounds, could be built as rapidly, and were more stable and durable.

The Milwaukee District

The construction of cement caissons was a unique accomplishment of the Milwaukee District. At times before the Civil War and in the years immediately after, all improvements at harbors on Lake Michigan had been under the direction of a single officer, and Milwaukee had frequently been his headquarters. After a United States Engineer Office was established at Chicago in 1870 a similar office was continued at Milwaukee. By 1916 responsibilities for Lake Michigan harbors were divided between what had become known as the Chicago, the Milwaukee and the Grand Rapids Districts of the Corps of Engineers. The Milwaukee District was responsible for harbors on the western shore of the lake north of Chicago. At that time a North Carolina born 1897 graduate of the Military Academy who had seen duty in Cuba, the Philippines, and China, Major Harley B. Ferguson, was in charge.

In 1916 William V. Judson, who by then was a Lieutenant Colonel, was District Engineer at Chicago. He and Major Ferguson belonged to a new generation of engineer officers who had come of age, not in the tragic years of the Civil War, but in the expensive era of the war with Spain. Before them and the country lay still greater conflicts. Years later a fellow engineer officer who became their best known contemporary, General Douglas MacArthur, was to write of the river and harbor functions of the Corps of Engineers, "... this particular activity, carried out with great success for many years by the Army Engineers, furnished the finest possible peace-time training for the manifold construction, engineering, and procurement tasks that devolve upon them in time of war. . . ."⁷

In 1916 America stood before the watershed of its participation in World War I. But the war did not change everything. For the large part, harbors on Lake Michigan had already, by 1916, been given the form and dimensions which they were to retain for 20 years.



Chapter 3

The Fox-Wisconsin and the Sturgeon Bay ship canals

The decade 1866-1876 was remarkable for the expansion of the Nation's railroads. In 6 years alone, from 1867 to 1873, more miles of railroad were built (33,000 miles) than had existed in the country at the outbreak of the Civil War (30,625 miles). Areas west of Lake Michigan benefited from this development as much or more than other regions. There was, nevertheless, considerable and frequently voiced dissatisfaction with available transportation facilities.

From as far away as Nebraska, but particularly in Iowa, Minnesota and Wisconsin, there were those who brought pressure on Congress for a speedy, cheap and direct medium of water transportation to the markets of the East and of Europe.¹ The Upper Mississippi Valley, "the very garden of the continent" had every resource and advantage, except a cheap and commodious means of transporting the bulky products of its soil to consumers at competitive prices.

The navigable waters of the Mississippi and St. Lawrence Rivers and the carrying places between these rivers and the Great Lakes were public highways, the proponents of the Fox-Wisconsin waterway said, which, by the Northwest Ordinance of 1787, were forever to be free to the inhabitants of every State. The waterways to the East should be improved. Where necessary, canals should be constructed and the whole should be operated without tolls or fees and be under the control of the national government. The financial and industrial East, it was often expressed, had profited much from the war and owed the waterway to the farmers of the northwest who had borne so much of the burden of the conflict.

Demands for Federal improvement of water communication between the Mississippi River and Lake Michigan began during the war when it was justified as concern for military defense of the northern lakes. There had been a canal convention in Chicago in June 1863, and again at Des Moines, Iowa, in March 1864.² At the latter convention delegates called for a ship canal reaching from the Mississippi River at some point opposite the eastern border of northern Iowa to Lake Michigan. The project was endorsed by both Houses of the Iowa State Legislature and businessmen and members of the State Legislatures of Illinois, Missouri, Wisconsin and Minnesota were asked to attend a May 1864 meeting in Dubuque, Iowa, to further discuss the matter.

Developments at the Dubuque convention were foreshadowed by the *Milwaukee Sentinel* which also endorsed the canal idea but emphasized that "the cheapest and best route between the lakes and the Mississippi River should be earnestly and faithfully represented." The *Sentinel* was reflecting sentiments of Wisconsin residents to the effect that a new canal connecting the Mississippi River with Lake Michigan should follow the historic route of the Fox and Wisconsin Rivers. Indeed, when the convention met at Dubuque on 4 May 1864, the idea of a canal to Lake Michigan from opposite the Iowa border, though it was revived at a later date, all but disappeared from the agenda in favor of one following the Fox and Wisconsin Rivers.

The Dubuque canal convention unanimously adopted a resolution which, while it did "not object to the construction of a ship canal from La Salle (Illinois) to the Mississippi River, if cheap and practicable," expressed the obligation to the "great bread winning states" to "persistently urge upon Congress the necessity of an appropriation for enlargement of the Fox and Wisconsin River improvements." The Fox and Wisconsin route, they resolved, was the cheapest and most practicable route, was necessary for military defense and would afford facilities for the cheap transportation of the products of the Northwest to an Atlantic and European market. The railroads, the resolution maintained, did not have and would never have the capacity to transport the 106 million bushels of wheat and 220 million bushels of corn likely to be harvested in Iowa, Wisconsin and Minnesota in 1868. Only a ship canal could handle these quantities of grain, the resolution said, a ship canal which followed "the nearest, cheapest, most expeditious and most practicable route." A "round-about way, as by the Illinois River, will never meet the demands and necessities of the country."

In support of their preference for the Fox-Wisconsin route its

advocates at the Dubuque convention cited with some disregard for historical fact the 30-year old survey by Captain Thomas Jefferson Cram, Topographical Engineer. They represented Captain Cram as having been assigned to Fort Winnebago at the Fox-Wisconsin portage for many years, during which time he allegedly observed that the Fox-Wisconsin route was dependable since "not in one single instance was the garrison stationed there ever straitened for supplies." They urged people of the Upper Mississippi Valley to exact from their representatives in Congress a pledge to be liberal in support of all improvements of a national character but their support of improvements should be contingent on the making of the ship canal to the lakes "part and parcel of such public works."

Five days prior to adjournment of the 39th Congress, on 23 June 1866 appropriations were made for river and harbor works of which \$2,000 was eventually allotted to a preliminary examination of the Fox-Wisconsin Rivers. The survey was placed in charge of Captain Charles R. Sutter of the United States Engineer Corps by Major Gouverneur K. Warren who operated from a headquarters of St. Paul, Minnesota. Captain Sutter's report was provided the Chairman of the Senate Committee on Commerce in February 1867 after the citizens of Wisconsin had petitioned Congress for an appropriation to improve the waterway. The report gave an account of the already existing dams and locks on the Fox River and of the canal which provided the connection between it and the Wisconsin River.³

In 1866 there were already 18 locks on the Lower Fox River, that stretch of the route between Green Bay and lower Lake Winnebago. The ascent on this stretch was 170 feet. The route passed through Lake Winnebago about 14 miles to the Upper Fox River which in a 110-mile stretch to the canal ascended another 40 feet. There were two locks at the canal. All locks were designed for a 4-foot depth of water, were 160 feet long and 35 feet wide. All these improvements were owned by the Green Bay and Mississippi Canal Company which had acquired them from the Fox and Wisconsin Improvement Company in 1866 after that company failed to live up to its agreements with the State of Wisconsin. The Fox-Wisconsin Improvement Company had built the improvements between 1846 and 1852 with funds made available from the sale of lands given by the Federal Government to the State of Wisconsin in 1845. In 1855 and 1856 additional lands for improving the Fox River were granted the State by Congress.

From the canal at the portage to the mouth of the Wisconsin River on the Mississippi River it was 112 miles, the descent about 150 feet. Lock and dam navigation was considered unsuitable on the Wisconsin

River and by 1866 no improvements had been made there. The depth of the bar at the Wisconsin River's mouth did not exceed 2 feet. Elsewhere the channel was similarly blocked with bars. Major Sutter favored narrowing the channel of the Wisconsin River by means of dams of brush or stone so as to obtain a 6-foot depth. Major Warren, on the other hand, favored an experiment in dredging of the bars to see what depths might be obtained in that manner. He felt a 3-foot depth at low water was the most which might be hoped for.

Although promising settlements had been made at an early date on the Wisconsin River, by 1866 commerce on the river had stopped and the settlements were dying out. The construction of railroads from Milwaukee to La Crosse and from Madison to Prairie du Chien had drawn the trade away from the banks of the river. When Major Warren submitted his final report on the improvement of the Wisconsin and Fox Rivers route from the Mississippi River to Lake Michigan (1876) he described conditions along the Wisconsin River in 1866 in words reminiscent of earlier periods.

The warehouses and many dwellings were abandoned and fell into decay. Long reaches of river became the almost undisturbed homes of wild animals. The Indians who had been moved further west began to struggle back to their old homes. While we were examining the rivers the smoke of their campfires could frequently be seen and around them they cooked and ate their game in primitive simplicity. Their canoes were often met by us. Almost every feature of the landscape as it was 200 years ago seemed in places restored and it required no effort of the imagination in the haze and mist of twilight to picture to ourselves the canoes of Jolliet and Marquette as they glided down the stream on their adventurous voyage of discovery.⁴

In February 1868 the Legislature of Wisconsin again sent a memorial to Congress pressing for an early completion of the ship canal project. The canal was needed "as a commercial measure to enlarge the already inadequate outlets for an increasing commerce, thereby lifting from freights and ultimately from the people extortionate tariffs. . . ." The Wisconsin Legislature saw the Fox and Wisconsin Rivers route, once the channel had been established at a minimum depth of 4 feet, as having a capacity little less than the Erie Canal. It anticipated the saving of \$9 million on 1 year's wheat crop of 60 million bushels by estimating the average rate per bushel for moving grain by rail from the Mississippi River to Lake Michigan as 29 cents and by water as 14 cents or less.



Two English born artists Samuel Marsden Brookes and Thomas H. Stevenson were commissioned in August 1856 by Morgan L. Martin, a Green Bay lawyer and promoter of the Fox-Wisconsin River improvements, to do a series of sketches of the Fox River. This view shows the dam and a portion of the first or guard lock at Kaukauna, about 23 miles upstream from the mouth of the Fox River, as it looked in 1856.

In November 1868 this theme was picked up and expanded at a convention held at Prairie du Chien, Wisconsin. The convention elaborated greatly on the comparison between the proposed improvement and the Erie Canal. "Both are eastern and western through routes, the one a continuation of the other . . . and . . . the commerce demanding the improvement today is little less in amount than the commerce seeking the Erie Canal." Much too was made of the savings which could be expected in freight charges if the waterway were improved. These savings would benefit both producer and consumer. "The duties on imports enriches the east and the entire country resulting in great part from the exports of the west." The undertaking would benefit the entire Nation.

In January 1869 and again in January 1870 the State Legislature of Wisconsin sent new memorials to Congress urging appropriations for the improvement. These were joined with similar memorials sent by the Legislatures of Iowa and Minnesota. In April 1870 Congress passed an act prohibiting expenditure on the Fox-Wisconsin River



route until the Green Bay and Mississippi Canal Company would agree to convey ownership of its property and franchise to the Federal Government. Experimental work which had been carried out on the Wisconsin River from 1868 onward was temporarily halted.

During 1871 and 1872 pressure continued to be placed on Congress for speedy action on the improvement. On 13 March 1871 the Legislature of Wisconsin complained to Congress that of the 1870 crop of wheat "but little comparatively has been moved, a result which, while occasioned by the great cost of movement, has in itself contributed to increase the cost of transportation. The products of wheat ... are practically shut off from the markets of the east by railroad barriers." The Legislature of the State of Nebraska joined the ranks of advocates for the waterway in February 1872 saying in its memorial to Congress that there was needed "... a cheaper system of transportation of its agricultural and other products to the eastern and European markets than does now or ever can exist or be secured with the present means and facilities furnished by the railroads. ..."

The same scene at Kaukauna, Wisconsin, as it looked in 1962.



When this Brookes and Stevenson painting of the lower lock at Appleton, Wisconsin, was made in 1856 the settlement there was only a few years old.

The demand in this period for improvement of the Fox-Wisconsin waterway and the rhetoric used to express this demand are related to postwar developments in the States of Illinois, Michigan, Wisconsin, Minnesota, Iowa, Kansas and Nebraska. In these States the Civil War left the Republican party in control. The very term "Democrat" had become nearly synonymous with "rebel." There was nevertheless, particularly in the 1870's, opposition to the dominant Republican party which took the form of third parties. These third parties were nearly unanimous in demanding the regulation of railway charges by the government and they were widely supported by the agricultural population of these States which was organizing during this period into clubs or granges, the most successful of which was the Patrons of Husbandry. Though officially nonpolitical, the Patrons of Husbandry, as well as other openly political farmers' organizations, not only desired government regulation of the railroads, they agitated for construction of canals, the improvement of river channels and, in particular, they favored the Fox-Wisconsin water route from the Mississippi River to Lake Michigan.⁵

The third party movement of the early 1870's was short-lived but it seriously threatened the Republican majorities and at times Republicans



took up the issues championed by the farmer groups. With the assistance of friendly Republicans the legislative bodies of Wisconsin, Iowa and Minnesota passed laws in 1874 designed to control the railroads. In this respect they were following the lead of Illinois, the general assembly of which had in 1871 passed the so-called "Granger Laws" which were meant to eliminate certain railroad activities such as discriminatory railway charges. The third parties soon disappeared and the railroad regulation was not generally effective but the parties and, in particular, the farmer organizations were not without more permanent effect. Republican Governors in Wisconsin, Minnesota and Iowa did not fail to show concern for the welfare of the farmers in their election platforms and advocated railroad regulations and, as we have seen, the Legislatures in these States regularly sent memorials to Congress urging improvement of the Fox-Wisconsin waterway.

At the national level in 1874 Minnesota Senator William Windom was chairman of a Select Committee on Transportation Routes to the Seaboard, which in its report advocated competitive routes under government control and development of waterways. Among other things it recommended improvement of "a continuous waterway of adequate capacity from the Mississippi River to the City of New York

The upper lock at Appleton as painted by Brookes and Stevenson in 1856. At the further end of the dam stands a flour mill which later became the site of a paper mill.

via the northern lakes." The committee maintained that "... the completion of the system of improvements suggested will effect a permanent reduction of 50 percent in the cost of transporting fourth-class freights from the valley of the Mississippi River to the seaboard and a similar reduction in return freights."⁶

Congress was not deaf to the demands of the Upper Mississippi River Valley States for improvement of the Fox-Wisconsin River. From 1870 through 1876 over \$2.5 million was appropriated for the improvement and large annual appropriations sometimes exceeding \$200,000 were made for some years. In October 1872 the improvements were purchased from the Green Bay and Mississippi Canal Company for \$145,000. To reach this figure the amount realized from the sale of lands granted by Congress to the State of Wisconsin toward the expense of the original improvement, \$725,000, was subtracted from the value of the improvement. "Value" in this instance was interpreted to mean the amount it would cost the government to build the improvements minus a reasonable sum for depreciation.

The responsibility for the improvements on the Fox-Wisconsin River was given to Major David C. Houston. In 1873, his assistant for operations on the Fox River was a civilian, Mr. N.M. Edwards, Assistant United States Engineer. Mr. John Nader, also an Assistant United States Engineer, carried out improvements on the Wisconsin River under Major Houston's direction. By 1876 the civilian engineers had been replaced with Army Engineer Corps officers, Captain Garrett J. Lydecker and First Lieutenant Frederick A. Hinman. Today the Wisconsin River is not within the boundaries of the Chicago District but it is discussed in this chapter since the success of the Fox-Wisconsin River waterway depended in part on the extent to which the Wisconsin River could be made navigable.

In 1872 Major Houston gathered information on both rivers so as to enable the formulation of plans and estimates for the improvement. On the Fox River plans and estimates were compiled on the basis of a draught of 4, 5, and 6 feet. Detailed planning was carried out on locks 160 feet long and 35 feet wide and a 4-foot channel depth but the work was to be done in such a way that increasing the depth to 5 or 6 feet or lengthening the locks might be accomplished with as little expense as possible.

In 1872 it was anticipated that to obtain a 4-foot channel and to put the locks and dams in order on the Lower Fox River would require dredging, removing boulders, replacing some lock gates, relining locks, repairing miter-sills, constructing embankments, and rebuilding some dams. The repairs, it was estimated, could be accomplished for



\$168,000. Upgrading the system on the Lower Fox River to a 6-foot draught, it was estimated in 1873, would cost about \$410,000 and would involve such activities as raising some of the dams; constructing coffer dams, excavating rock in, above and below locks; sinking lock miter-sills or raising lock walls and gates; and dredging in the river channel.

In 1872 the Lower Fox River, from the first dam at De Pere, the natural head of navigation to the Upper Fox River, formed, as a result of the dams, a system of 9 terraces which vessels could ascend or descend by means of the locks. Since the government survey in 1866 a new lock and dam had been built on the Upper Fox River at Montello. The new lock which was considered "first class" had walls of large blocks of sandstone and the head of the lock was set in masonry. The dam was constructed of crib work with masonry abutments. The dam at Montello created a pool some 14 miles long which in the

The upper lock at Appleton as it looked in 1962.

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plans for improvement of the Fox River was to be the 14th level above the natural head of navigation at De Pere. On the Upper Fox River four locks and dams were planned below, and two locks and dams above, the dam at Montello. In all, 19 pools were needed on the Fox River to reach the approximate level of the portage canal.

The canal at the portage was about 2½ miles long and had a light lift lock from the Fox River into the canal and a guard lock at the Wisconsin River end. Work on the Wisconsin River through 1872 had been limited to the construction of dams of brush, stone and gravel in such a way as to confine the river to a single channel at points where it was shallow and divided by islands into 2 or more channels. The dams were built low so as to confine the water to a single alternate channel at low stages but not to obstruct the flow during high water. Twenty-two such dams were built in 1871 with a total length of 6,621 linear feet, and 24 were built the following year with a total length of 9,344 linear feet. It was planned in 1875 to continue the wing dam building operations until a reliable 3-foot channel could be established. Still, Army Engineers remained uncertain as to whether "a channel adequate to the demands of commerce" could be secured and maintained without more extensive engineering work than the construction of wing dams.

It became apparent by 1875 that nearly all of the old locks and dams on the Lower Fox River would need to be rebuilt. By 1876 the portage canal had been enlarged and navigation opened connecting the two rivers. Four new locks were under construction that year on the Upper Fox River. Four locks and as many dams were being rebuilt on the Lower Fox River. It was established that approximately \$3.25 million would be needed to complete the improvement and additional funds would be needed to satisfy a number of claims being made against the Government for flowage damages allegedly caused by the dams.

Although 108,000 linear feet of wing dams had been built on the Wisconsin River by 1886, the shifting nature of the sandbars there and the lack of clearly defined channels prevented regular use of the river for navigation. The general subject of the Fox-Wisconsin Rivers improvement was referred to a Board of Engineers which in 1887 recommended against any further attempt to improve the Wisconsin River by means of wing dams. This recommendation put an end to the dream of turning the Fox-Wisconsin Rivers route between the Mississippi River and Lake Michigan into an Erie Canal of the West. No further improvements for navigation were made on the Wisconsin River.⁷

However, improvements for local commerce were continued on the Fox River according to a plan approved by the Secretary of War in 1884 and modified by the Chief of Engineers in 1886. The modified project, which applied to the Fox River only, contemplated renovating 10 old locks, rebuilding one lock and widening the channel of the Fox River downstream from Montello to Green Bay to 100 feet while providing for 6 feet of depth over the same river stretch. Four-foot depth at low water was to be maintained upstream from Montello to Portage.

By the turn of the century just over \$3 million had been spent by the Federal Government on improving the Fox and Wisconsin Rivers. Of this amount \$403,000 had been appropriated solely for and expended on the Fox River since 1885. For this expenditure on the Fox River 15 new stone locks, 11 composite locks, 16 permanent dams, 12 canals, and numerous other projects had been completed including a harbor of refuge at Stock Bridge Landing on Lake Winnebago. These improvements had been carried out under the direction of Corps of Engineers officers, Captain William L. Marshall, 1884-1889; Major Charles E.L.B. Davis, 1889-1892; Major James F. Gregory, 1892-1894; Captain Carl F. Palfrey, 1895; Captain George A. Zinn, 1896-1898; and Captain James G. Warren, 1899-1905.

During the 1890's there was uncertainty as to the rights of individuals and those of the United States in connection with the waterway. On several occasions the Federal Government brought suit against mill owners who drew off such quantities of water from behind Government dams for the operations of their mills as to seriously hamper navigation. Major Gregory complained in 1894 that "If it were not for the millers at Menasha and Kaukauna drawing the water down below the crests of the dams, boats drawing 6 feet could have run at any time during the season of navigation from Oshkosh to Green Bay..." "Navigation," he said, "is absolutely at the mercy of the water users."⁸

The rivers and harbors act of 3 June 1896 directed an investigation by the Secretary of War of the property rights of the United States in connection with the Fox and Wisconsin Rivers improvements. By 1900 the Secretary of War was able to protect the interests of navigation and water would not be drawn below the crest of the Menasha Dam, for example, without his special permission. But the right to use water after the needs of navigation were met was a complex issue. Controversies and lawsuits concerning the ownership of this water were frequent during the first decade of the 20th century.

By 1900 the principal effect on commerce of the Fox River

The Fox-Wisconsin and the Sturgeon Bay ship canals

improvements was considered to be the reduction of freight rates generally in the Fox River valley. In 1908 the Corps reported that the benefits to commerce were small in comparison with the expense of the improvements and again in 1910 called attention to the relative unimportance of the commerce on the Fox River. Nevertheless, in 1915 there were 15 steamers, 7 tow barges and scows and 6 registered gasoline launches operating on the Fox River. Their net tonnage was 1,914. The steamers and launches carried some 73,000 passengers. Total freight traffic estimated at 149,872 tons was valued at \$815,000. In terms of both weight, 84,690 tons, and value, \$423,450, coal was the biggest freight item.

The project for the Fox-Wisconsin Rivers route from the Mississippi River to Lake Michigan did not fulfill the expectations of its proponents. A more modest navigation project, the Sturgeon Bay and Lake Michigan Ship Canal, was more successful.

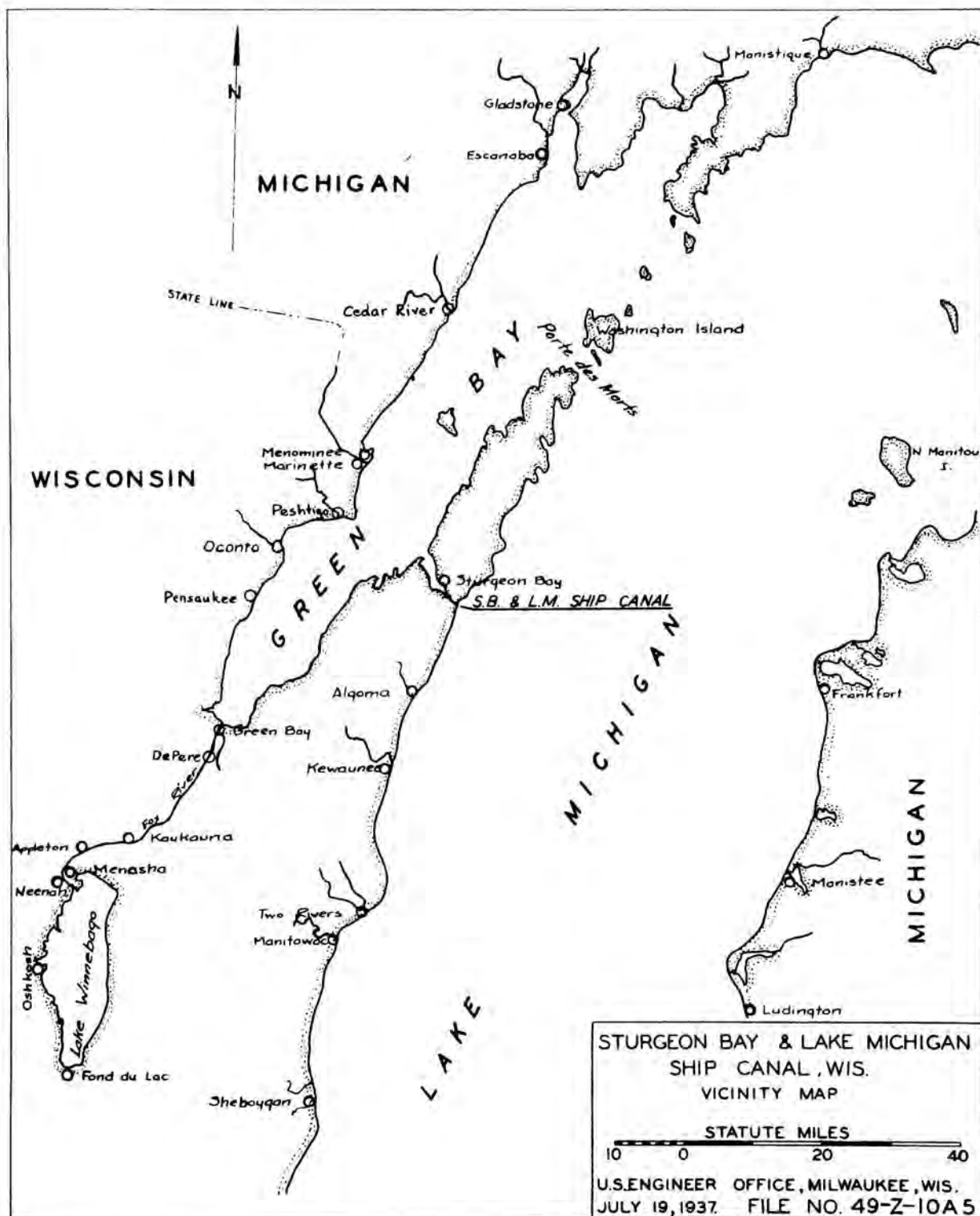
The Sturgeon Bay and Lake Michigan Ship Canal

The eastern shore of Green Bay is formed by a 70-mile long peninsula with an average width of 10 to 12 miles. This peninsula divides the southern section of Green Bay from Lake Michigan. At a point halfway up the peninsula on the Green Bay side there is a deep indentation called Sturgeon Bay. A neck of land only 6,400 feet wide divides the eastern extremity of Sturgeon Bay from Lake Michigan.

The feasibility of cutting a canal across this narrow isthmus was recognized at an early date. Already in 1854 a company was incorporated with authority to cut the canal, but the company passed out of existence before any work could be accomplished. In 1864, however, a group of men from Milwaukee, Chicago, and northeastern Wisconsin, all interested in lumbering and related industries, formed a new corporation called The Sturgeon Bay and Lake Michigan Ship Canal and Harbor Company.

On 10 April 1866 Congress granted 200,000 acres of land to the State of Wisconsin to aid in the construction of the ship canal. This land was to be selected from available federally owned land near the site of the proposed canal. On 10 March 1868 the State began turning over the 200,000 acres, including 100,000 acres containing some of the finest timber in Wisconsin, to the company incorporated in 1864. In return, the company agreed to construct the canal and otherwise meet the requirements intended by Congress in making the grant.

Facing page:
The Sturgeon Bay and
Lake Michigan Ship
Canal and the region of
Green Bay on the northern
port of Lake Michigan
surrounding the canal.
The canal, which was
built by a private com-
pany, was paid for with
the sale of 200,000 acres of
public land. It was
completed in 1881. In
1893 the Federal Govern-
ment took over the canal
and opened it free to all
commerce.





The Sturgeon Bay Ship Canal, which was constructed by a private company across a narrow peninsula dividing Green Bay from Lake Michigan, was originally paid for with 200,000 acres of public land given by Congress for this purpose to the State of Michigan in 1866. The canal was completed in 1881 and operated by the company until 1893 when it was taken over by the Federal Government and thereafter improved and maintained by the U.S. Army Corps of Engineers.

Work on the canal was carried out at irregular intervals. For a time, from 1874 to 1877, operations were suspended completely. In December 1881, when the Governor of Wisconsin certified the canal to be complete, the canal was 7,400 feet long, 100 feet wide at the water's surface and from 11 to 13 feet deep. In addition, a channel had been excavated for a distance of 6,100 feet into Sturgeon Bay with the approximate width and depth of the canal. At the Lake Michigan end the shoreline had been protected north and south of the canal entrance with a few hundred feet of timber work filled with stone. Otherwise, all the work at the Lake Michigan end of the canal was carried out by the Federal Government. The canal was operated by the company and tolls, apparently not excessive, were charged for its use.

A special Board of Engineers authorized in the River and Harbor Act of 5 August 1886 to examine the canal, its relation to commerce, and the desirability of its acquisition by the Federal Government came to the conclusion that the importance of the canal "... to the general commercial interests of that section have not been as great as have been sometimes represented, and that there was a speculative interest in the land grant which had no connection with commerce." By 1886 the yield of timber on Green Bay had diminished and the Board reported, "the advantages of the canal to the mill companies

have proportionately declined. It is not a matter of surprise," the Board added, "that the time has come when the subject of transferring the canal to the government, for maintenance and repair, should be agitated."⁹

The Board reported that the tonnage of the canal had gradually increased from 32,000 tons in 1879 to 745,000 tons in 1882 and then had declined gradually to about 375,000 tons in 1886. It was believed that tonnage would not continue to decrease in this fashion since the decline in lumber tonnage would be offset by the increase of population in northeastern Wisconsin and the development of manufacturing and mining industries there.

The River and Harbor Act of 13 July 1892 appropriated \$81,833 with the intent of making the canal free to commerce. The canal was purchased from the company and the United States assumed control on 25 April 1893. Between 1893 and the end of the century Federal funds were used to widen the canal and deepen it to 16 feet. In 1902 the canal project and the Sturgeon Bay Harbor of Refuge project begun in 1873 were united into a single project. An act of 13 June 1902

In 1916, about the time of this photo, 7,000 vessels used the Sturgeon Bay Ship Canal and 540,000 tons of freight valued at nearly \$12 million were carried over this short cut water route between Lake Michigan and Green Bay.



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provided for increasing the depth of the canal to 21 feet. As anticipated in 1886 the volume of commerce through the canal did not decrease beyond the 375,000 tons reported in that year. In 1899, 898,000 tons of freight and over 14,000 passengers passed through the canal. Some 15 craft passed through the canal daily during the shipping season. A number of vessels of the 1,000-ton or more class were using the waterway and Captain James G. Warren, then in charge of the canal, believed that such vessels would use the canal more regularly if deeper water were available.

In 1916 nearly 7,000 vessels used the canal. Those registered included some 2,000 steamers, 564 sailing vessels, and 182 unriggered craft. Unregistered vessels included 812 pleasure craft and nearly 3,500 fishing vessels. In all, 540,000 tons of freight with an estimated value of nearly \$12 million were moved through the canal that year.

Both the Fox River and the Sturgeon Bay and Lake Michigan Ship Canal projects were, in 1916, responsibilities of the Milwaukee District.

Chapter 4



The Illinois and adjacent waterways

In the decades following the Civil War the State of Illinois and the Federal Government improved the Illinois waterway, the other historic link between Lake Michigan and the Mississippi River. Much of the history of the Illinois waterway was determined by the phenomenal growth of Chicago and matters little related to waterborne commerce; the disposal of the large amounts of sewage incidental to such a vast city and the congestion of thoroughfares, people, and structures along, over and under the Chicago River.

The State of Illinois which had been granted 284,000 acres of land by Congress in 1827 to aid in the construction of a canal to join the waters of Lake Michigan with those of the Illinois River had by the spring of 1848 opened a canal, with 16 locks 110 by 18 by 6 feet, reaching from Chicago to LaSalle on the Illinois River, a distance of 97 miles. The capacity of the canal when completed was equal to what had been originally contemplated but, to build the canal with available funds, a significant change had to be made in the original plan. The original intention had been to cut down the divide or summit between Lake Michigan and Lockport so that water could be drawn from Lake Michigan to maintain required depth in the canal. Instead, the canal was completed for about 26½ miles on a level about 9 feet above the originally planned bottom. Water was supplied for the summit by means of a feeder canal from the Calumet River about 16½ miles long. In addition, works were built at Bridgeport on the Chicago River 5 miles from Lake Michigan which pumped water from the Chicago River for the summit of the canal.

The Chicago River was used by the city of Chicago for disposal of sewage. As the city grew, as one contemporary described it, "... the foulness of the river increased to such a degree as to demand the adoption of some plan for its amelioration." The assembly of the State of Illinois on 16 February 1865 approved an act to provide for the completion of the Illinois and Michigan Canal upon the original plan with the object of cleansing the Chicago River by cutting down the summit so as to obtain a flow of water which would pass from Lake Michigan through the Chicago River to the Illinois River. The work, which was undertaken by the city of Chicago, was begun in 1865 and completed in 1871. In time, from various causes such as caving and sliding of banks, the capacity of the canal was greatly reduced and less and less water flowed past such points as Lockport and Joliet. The canal became more and more offensive. To provide more water new pumping works were built by the State of Bridgeport with a capacity of 60,000 cubic feet per second.

From 1866 through 1886 the U.S. Army Corps of Engineers was variously involved in the improvement of the Illinois River portion of the Illinois waterway. General James H. Wilson, Illinois-born cavalryman and engineer, was in charge of a survey of the Illinois River in 1866.

The following year, on 8 May 1867, a Board of Engineers consisting of General Wilson and Mr. William Gooding, United States Civil Engineer, was established for "conducting surveys and examinations and preparing plans and estimates for a system of navigation by way of the Illinois River between the Mississippi and Lake Michigan adapted to military naval and commercial purposes." The plan of improvement recommended by the board was to create a slack water system in the Illinois River from near its mouth to the head of Lake Joliet, securing by means of locks and dams a navigable depth of 7 feet at the lowest known stage of the river. The improvement of the river was to be accompanied by a corresponding enlargement of the Illinois-Michigan Canal. The estimated cost of the entire improvement was somewhat over \$18 million.

In 1868 General Wilson made a special examination of the river to select sites for the contemplated locks and dams. In that year \$85,000 was allotted for improvement of the Illinois River from LaSalle to its mouth. This sum was too small to begin the slackwater navigation project and it was withdrawn without having been used. General Wilson recommended that \$300,000, the amount required for one lock and dam, should be the minimum appropriation with which to begin the project. This amount was requested but it was not appropriated by Congress. Instead, the assembly of the State of Illinois in an act

approved 10 April 1869 directed construction of a lock and dam at Henry as a first step in the project. The work which was performed under the direction of the Illinois State Board of Canal Commissioners conformed with the plan of improvement recommended by the United States Board of Engineers. The Henry Dam was opened to navigation in 1871.

When Congress appropriated \$2 million for river and harbor improvements on 10 April 1869, some \$84,000 was allotted for improvement of the Illinois River. This time the sum was used by the Corps of Engineers toward dredging the river below the Henry Dam to the site of the next proposed dam at or near Copperas Creek so as to give a depth of 7 feet with less height of dam at the latter place. In the following year, in view of the small appropriations, General Wilson revised the concept. He now hoped to provide a channel with a 4-foot depth at low water by means of dredging and construction of wing dams. This plan continued in force for a number of years. In the fall of 1870 Colonel John N. Macomb of the Corps of Engineers succeeded General Wilson on the Illinois River project. Colonel Macomb continued the dredging and wing dam building operations toward obtaining a 4-foot channel and was in charge of the construction beginning 1 September 1875, with about \$80,000 of Federal funds, of the foundation for the lock at the Copperas Creek Dam. This work was turned over to the State in September 1874.

In 1877 the State of Illinois completed the Copperas Creek Dam. Both the Henry and Copperas Creek Dams were low. Nevertheless, the Henry Dam created a pool of water which significantly increased the depth of the river to LaSalle, some 29 miles upstream. The Copperas Creek Dam created a pool of increased river depths as far upstream as the Henry Dam, some 59 miles. With additional dredging and by placing 1-foot high flash boards on the dams, a river depth of 7 feet could be obtained at low water in the pools created by the Henry and Copperas Creek Dams.

The locks at these dams were 350 feet long and 75 feet wide and carried 7 feet of water over their miter-sills. Both locks were under the management of the Illinois State Board of Canal Commissioners and were regarded as extensions of the Illinois and Michigan canal. The State levied tolls on commerce passing through the two locks.

Meanwhile, other than constructing the foundations for the Copperas Creek dam, the Federal effort on the Illinois River had been confined to dredging and the construction of wing dams. In the 9-year period beginning in 1869, the Federal Government had spent \$344,000 in improving the Illinois River, \$235,000 of which had been

used on dredging. Captain Garrett J. Lydecker replaced Colonel Macomb in the fall of 1877 and contracts for dredging operations then in force were continued only until 30 June 1878. Thereafter for several years no further dredging was done by the Federal Government. By dredging and building of wing dams a navigable depth of 4 feet had been obtained on the Illinois River below Copperas Creek but, even so, some bars would not carry more than 2½ feet at very low water. The dredging gave immediate relief to navigation but was considered a stopgap type of operation necessitated by lack of sufficient federal funds to carry out the original slackwater navigation plan. In 1878, in a special report on improvement of the Illinois River, Captain Lydecker said, "It would be far better to build the necessary locks and dams at once. . . ." He recommended the construction of two more locks and dams on the Illinois River, one of which was to be located at LaGrange 58 miles below the Copperas Creek dam and the other at Kampsville 48 miles below LaGrange. He urged the appropriation of \$400,000 in fiscal year 1880 to construct one lock and dam and perform the necessary dredging to achieve the desired depth after the dam was constructed. These 2 dams, Captain Lydecker believed, would cost less and would accomplish more in less time than continued dredging and construction of additional wing dams. He did not fail to add that at the time of his report the slackwater system using locks and dams was not popular in the area. The dams at Copperas Creek and Henry were even regarded as obstacles to navigation. This was due, he believed, to excessive tolls charged by the State which used funds earned at the locks to maintain the Illinois and Michigan canal.

Congress appropriated \$110,000 for improvement of the Illinois River in 1880, \$250,000 in 1881, and sums ranging between \$100,000 and \$200,000 each year through 1892. In 1880 and 1881 work was commenced on the lock at Kampsville; in 1882 and in 1883 lock pit excavation was commenced at LaGrange.

In 1882 Captain Lydecker was replaced by Major William H.H. Benyuard who remained in charge of the Illinois River improvements until 1886. Major Benyuard was succeeded by Major Thomas H. Handbury from 1886 to 1888. During this period the lock at LaGrange was completed. Major Handbury was followed by Captain (after 10 May 1895, Major) William L. Marshall from 1888 to 1899. The Kampsville Dam was not fully completed and the lock opened to navigation until fiscal year 1893. By this time the State of Illinois no longer favored a system of locks and dams on the Illinois River. It proposed producing

navigable depths on the Illinois River by increasing the draw off of water from Lake Michigan.

The State of Illinois, by an act in 1882, ceded the Illinois and Michigan canal to the United States for the purpose of making and maintaining an enlarged canal and waterway from Lake Michigan to the Illinois and Mississippi Rivers. By this act the State did not, however, offer to relinquish control over the locks and dams at Henry and Copperas Creek. In August 1886 Congress, as part of the river and harbor act of that year, authorized the Secretary of War to appoint a board of three Army Engineer officers to look into the advisability of accepting the cession, examine the Illinois and Michigan canal, and consider its value and its usefulness to navigation. The board was also to consider the usefulness to commerce of a new canal which would extend westward from near Hennepin on the Illinois River to a point on the Mississippi River near Rock Island and Fulton, Illinois.

The Secretary of War, William C. Endicott, concurred in the board's evaluation of the Illinois-Michigan canal's significance to commerce. The canal was seen as a freight carrier but also as a freight rate regulator. The board estimated that in a 5-year period the Illinois-Michigan canal saved producers and consumers over \$2 million in freight charges. "It is a matter of very little consequence," the board reported, "whether the canal carries any freight or not so long as the fact that it is there, and in readiness for the purpose affects the charges by rail."²

The Board of Engineers did not, however, recommend the acceptance by the United States of the cession of the Illinois and Michigan canal from the State of Illinois for the following reasons. Accepting the canal would commit the Federal Government to enlarging the existing canal whereas the Engineers estimated it would be less expensive to enlarge the river between Joliet and LaSalle than to enlarge the canal proportionate to the improvements being made farther downstream. The State of Illinois should not bind the Federal Government, they said, to enlarging the canal if a less expensive and more suitable waterway might be obtained in another way.

In addition, the board seriously questioned the appropriateness of the existing terminus for the eastern end of the canal on the south branch of the Chicago River. The south branch of the Chicago River ran through Chicago's business district and was crossed by numerous drawbridges which provided impediments to both navigation and land traffic. Economy and convenience might demand another outlet for the canal, a different channel to Lake Michigan. The Secretary

The Illinois and adjacent waterways

of War also agreed with the board's report that all works including the improvements at Henry and Copperas Creek should be transferred to the United States if the cession were to be accepted.

The State of Illinois cession of 1882 of the Illinois and Michigan canal expired by limitation on 5 November 1887. Although the State of Illinois, by an act approved 31 May 1887, had also ceded to the United States the State works at Henry and Copperas Creek, the Federal Government still did not accept the cession.

The reluctance of the Federal Government to accept the responsibility for enlarging the Illinois-Michigan canal left unsolved Chicago's ever increasing sewage problem. The deepening of the summit level of the canal from 1866 to 1871 had provided only temporary relief. On 2 August 1885 a great downpour in the Chicago area swept the filth of the Chicago River into Lake Michigan as far out as the intake for the city's water supply some 2 miles from shore. A number of solutions were considered. One plan involved shifting the water supply intake farther north and dumping the sewage into the lake. Another plan considered onland disposal mostly in Indiana. These alternatives were eliminated as too costly or otherwise unsatisfactory. A third plan proposed a new ship canal from the Chicago River to the Illinois River with sufficient capacity to dilute the sewage "beyond offense." If it could be demonstrated that the new canal project was important for navigation, the Federal Government might be induced to construct it.

The canal plan was discussed at an Illinois River improvement convention which met at Peoria, Illinois, on 11 and 12 October 1887, and it was publicized in a booklet, "The Lake and Gulf Waterway," published by the citizens of Chicago in January 1888. Congress, in response, on 11 August 1888 authorized a survey of the Illinois River for a channel "not less than 160 feet wide, and not less than 14 feet deep from LaSalle to Lake Michigan." The purpose of the survey, according to the act, was to secure "a continuous navigable waterway between Lake Michigan and the Mississippi River having capacity and facilities adequate for the passage of the largest Mississippi River steamboats and the naval vessels suitable for defense in time of war." At this time, from 1888 to 1899, Federal improvements on the Illinois River were the responsibility of Corps of Army Engineers officer, Captain William L. Marshall.

On 27 August 1888 the Chief of Engineers instructed Captain Marshall to conduct the survey of the Illinois River authorized by Congress some 2 weeks earlier. Captain Marshall's report which was submitted on 28 February 1890 was devastating. River commerce did

Facing page:
Brigadier General William L. Marshall, from 1908-1910, Chief of Engineers, was in charge of river and harbor improvements in the Chicago area in the 1890's.



not justify, he maintained, a 14-foot depth on the Illinois-Michigan waterway. Nearly 98 percent of the steamboats representing 88 percent of the tonnage navigating the Mississippi River and its tributaries, 712 vessels in all, drew less than 8 feet of water in 1888. Less than 2 percent of the vessels, 14 in all, drew 8 to 9 feet. Three vessels drawing over 9 feet in 1888 had by 1890 been lost or had been broken up. The 14 vessels with a depth of hold between 8 and 9 feet were used on the Ohio and Mississippi Rivers at good navigation states of water below Cincinnati and St. Louis. All the powerful towboats, Captain Marshall reported, of the Pittsburgh coal companies and the iron transportation companies and the lumber rafting boats of the Upper Mississippi River Valley drew less than 8 feet of water. He pointed out that the largest Mississippi River steamboat that could reach the mouth of the Illinois River (in 1890) was one with a depth of hold 6 feet 2 inches and about 7 feet extreme load draught. Instead of a 14-foot channel he favored an 8-foot channel. A 14-foot channel "based upon the present or probable future navigation of the Mississippi River and tributaries . . . is not a public necessity," he said. The construction of a 14-foot channel could wait "pending further consideration since all mechanical construction would decay, if built now, before their full use would be available."³

Captain Marshall favored the slackwater navigation system then being constructed on the Illinois River to the open channel with increased discharge advocated by the 14-foot navigation proponents. He pointed out that increased discharge for navigation would be desirable only during low water stages whereas the proposed discharge would be constant whether beneficial or harmful to navigation. Furthermore, during periods of naturally high water, water artificially introduced by means of the proposed canal could result in damages from flooding.

Captain Marshall also favored a route for the Illinois waterway which would depart from the Chicago River portion of that route and pass eastward practically on the line of the Calumet feeder to the Little Calumet River through Lake Calumet to the Calumet River and eventually to the harbor at Calumet on Lake Michigan. The interests of commerce would best be served by the Chicago River route, he said, if that route could at reasonable expense be made capable of permanently accommodating the increased traffic which would result from the improved waterway. However, during a 7-month navigation season in 1890 nearly 22,000 vessels had been noted at the Chicago Harbor. Almost all of the business of the port, except for a relatively small amount which used the Illinois Central docks and the

Ogden slip, was carried out at docks and slips along the Chicago River. The river was crooked and obstructed by numerous swing bridges. People from the populous north and west side of the city were cut off from the business district by the main river and its south branch. The opening of a bridge at times would block streets for long distances or bridges would not be opened because of heavy land traffic and the vessels would be detained. "The Chicago River," Captain Marshall concluded, "cannot accommodate any material increase in the number of vessels using it." Furthermore he said, "It is only a question of time when the space now occupied by elevators, lumber and coal yards, docks and wharves will to a great extent become too valuable for such uses." On the other hand, "The terminal facilities . . . the ample and locked natural basins for the construction of a great development of wharves and docks and commodious harbors in public waters . . . scarcely excelled anywhere in the Great Lakes point irresistibly," he emphasized, "to the Calumet region as the proper terminus of a great waterway between the Great Lakes and the Mississippi River."⁴

Since the United States Government from 1882 to 1886 had already obtained releases from property owners for a right-of-way along a considerable stretch of the banks of the Calumet River, it could control the matter of bridges over the stream. The estimated cost of the Calumet route was less than that via Chicago, its execution would be easier and, finally, "There is no strong local necessity disconnected from the interests of navigation to control or interfere with the execution of the work on a strict national basis."

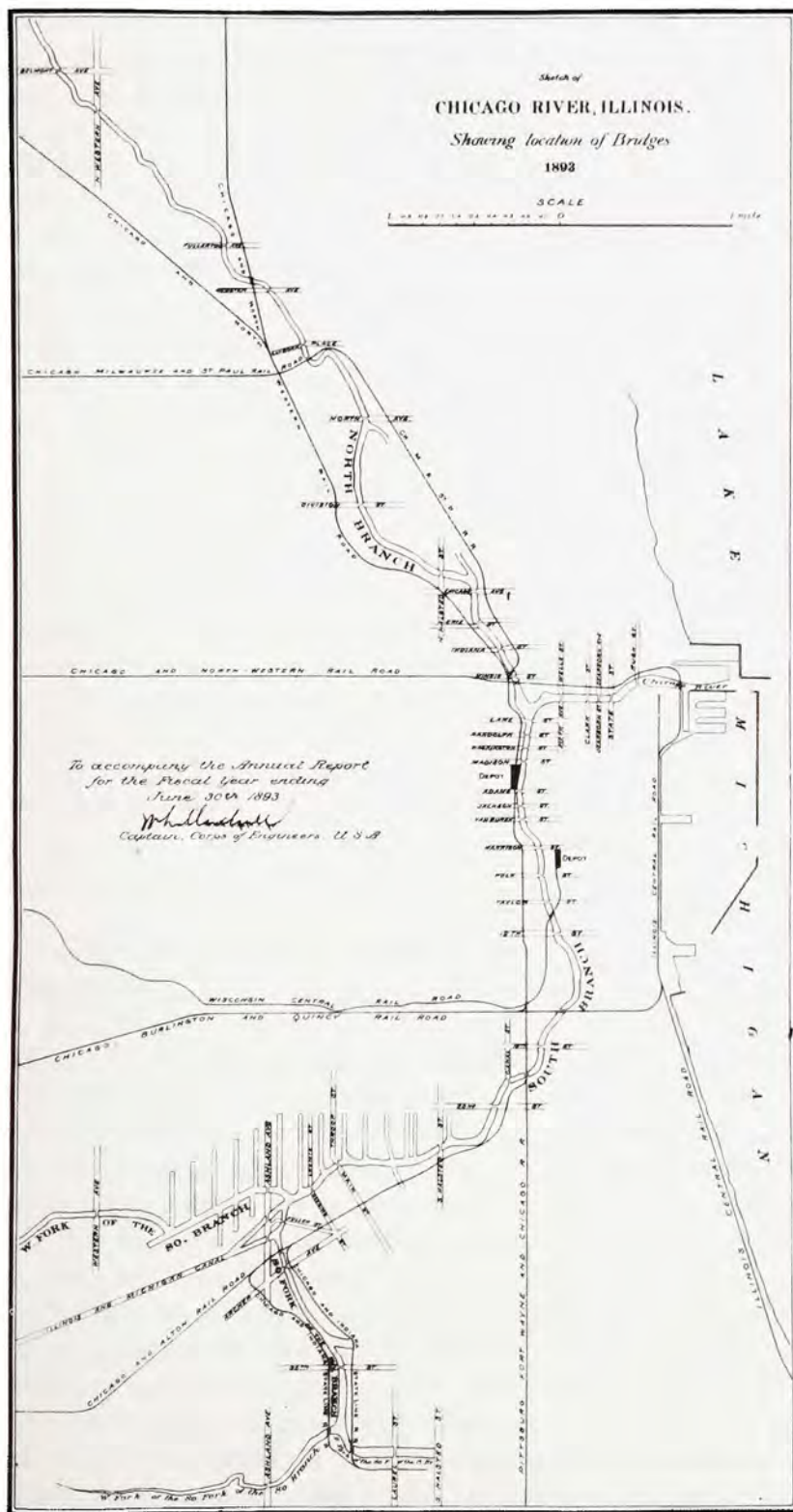
Captain Marshall's report, an Illinois State publication complained, "breathed an adverse spirit"⁵ Nevertheless, his annual reports are remarkable documents and in many respects his convictions have a contemporary ring. "The disposal of sewage and filth by turning it into streams is distinctly contrary to all civilized judgment and experience," he wrote in an 1893 report to the Chief Engineer.⁶

Before Captain Marshall's report on the feasibility and desirability of a 14-foot channel in the Illinois River was completed, the general assembly of the State of Illinois, on 1 July 1889, approved "an act to create sanitary districts and to remove obstructions in the Des Plaines and Illinois River." This act made possible the organization of the Sanitary District of Chicago, in October 1889, with boundaries covering Chicago and five adjacent municipalities, an area of about 185 square miles. In September 1892 the Sanitary District of Chicago began construction on the Chicago Sanitary and Ship Canal which when completed in January 1900 reached from the Chicago River at

Robey Street, 6 miles from Lake Michigan, to Lockport on the Des Plaines River, a distance of 28.5 miles. The canal which was 22 feet deep varied in width at the bottom from 110 to 160 feet, at the top from 162 to 290 feet. The Sanitary and Ship Canal was located adjacent and generally parallel to the Illinois and Michigan Canal. The immediate purpose of the canal was sewage disposal by dilution with the additional objective of providing a deep waterway.

Captain Marshall continued to breathe an adverse spirit. The State, in its act of 1 July 1889 to create sanitary districts and "to remove obstructions in the Des Plaines and Illinois River," had provided for the removal within 4 years of the State dams at Henry and Copperas Creek. Captain Marshall, who noted at the close of 1893 that no steps had been taken to remove the dams, could not believe that "an efficient system of navigation will be destroyed until it is replaced by one at least equally effective." The Kampsville Federal lock and dam was opened to navigation the year before the commencement of the Sanitary and Ship Canal which, its proponents believed, would render the dams in the Illinois River obsolete. Captain Marshall continued to maintain that the slackwater navigation project of the Federal Government which extended 137 miles from the Mississippi River to Copperas Creek along with the 87 miles of river already improved by the State would, once dredging had been completed, provide depths varying from 7 feet at extreme low water to 12 feet at mid-high stage. If these depths were obtained, he wrote the Chief Engineer in 1893, "The Illinois River . . . will fulfill all the reasonable requirements of navigation by western river steamboats." The following year, in 1894, he was determined that the State should not remove the Henry and Copperas Creek Dams "until the levels in the Illinois River are produced and maintained by equivalent means." He recommended condemnation of the State dams by the Federal Government if they could not be obtained from the State by legislative transfer.⁷

Meanwhile, the Federal Government continued to improve the Illinois River by dredging below the Kampsville lock and dam and Major Marshall continued to recommend completion of the project. The tonnage on the Illinois River, he pointed out in 1896, had increased over 200 percent in 6 years and this had taken place even though as yet there was barely a 4-foot channel on the river. That sufficient funds were not provided to dredge to the planned depth was due, he did not doubt, to the "persistent advocacy of local schemes by promoters with . . . specious arguments . . . for schemes already examined into and rejected."⁸



The Chicago River in 1892 four years prior to its adoption as a Federal project. In the lower left the eastern end of the Illinois and Michigan Canal can be observed.

After 1886 there were no appropriations for work on the Illinois River for several years but, in 1899, \$200,000 was appropriated, the largest appropriation in 10 years. As soon as the appropriation was made Government equipment was put in order to begin work, but high water in the summer of 1899 prevented dredging. In 1899 Major Marshall reported that the Chicago Sanitary and Ship Canal was so near completion that, before 30 June 1900, 5,000 cubic feet of Lake Michigan water per second was expected to be turned into the south branch of the Chicago River. Whatever amount might reach the Illinois River from Lake Michigan through the Sanitary and Ship Canal it would be insufficient to make the Lower Illinois River navigable without the LaGrange and Kampsville locks and dams.

Improvement of the lower Illinois River was only one of the projects for which Major Marshall was responsible. He spent part of his time supervising the construction of a canal connecting the Illinois River at LaSalle with the Mississippi River at Rock Island. The canal, which had 33 locks, used practically every type of structure then employed in canal construction. Marshall pioneered in the use of concrete and developed methods which were eventually adopted widely for such undertakings. The canal, called the Hennepin Canal until 1888 when its name was changed to Illinois-Mississippi Canal, today belongs to the State of Illinois and lies within the boundaries of the Rock Island District of the Corps of Engineers.⁹ More pertinent to the district boundaries of the present Chicago District were Major Marshall's responsibilities in connection with improvements on the Chicago and Calumet Rivers.

"The Chicago River," Captain Marshall wrote in 1893, "is the most important navigable stream of its length in the world." Of United States harbors Chicago was second only to New York in terms of tonnage "but," he said, "in capacity, depth, and width of navigation it is but a third class port." At a time when improvements were under way at many Great Lakes ports to achieve 20- to 21-foot depth, the Chicago Harbor had but a 16-foot depth at the entrance to the Chicago River. The Chicago River, where most of the harbor traffic congregated, could not be deepened beyond 15 or 16 feet because of two tunnels under the river, one at Washington Street, the other at LaSalle Street, with no more than 16 to 18 feet of water over their crowns. In addition, the river was obstructed by an average of four bridges to the mile and its course was lined by wooden docks, heavy buildings, elevators, etc., many resting on piles and sheet piles but a few feet below the bottom of the channel and built up close to the water's edge so as to prohibit a channel next to them exceeding 16

to 18 feet without danger of their collapsing. At places the river had been contracted to less than half its original width by piles or riprap of stone placed in the stream to buttress inefficient bulkheads or docks. Bends in the river, with curves rigidly fixed by structures built along the edge of the channel, would not permit the passage of modern vessels. Because of these obstructions, tugs, frequently two per vessel, had to be used for movement of all vessels above the juncture of the north and south branches of the river. The cost of moving the larger vessels to the elevators above 22nd Street and back to the lake, Captain Marshall learned, was equal to one-half the cost of transporting the cargo from Chicago to Buffalo. In addition to all this, the Chicago River was an open sewer.¹⁰

Up to 1893 no improvements had been made on the Chicago River by the Federal Government. The navigable portions of the river were wholly within the bounds of the city of Chicago and Cook County. The Federal Government had improved the harbor entrance and built harbor protection lakeward of the original shoreline. The river had been improved partly by the city of Chicago but mainly by individual and corporate riparian owners who dredged the river and constructed bulkheads or docks as individual uses, fancies or profit determined. The Chicago River, Captain Marshall commented, "one of the indispensable arteries of commerce upon which is based the eminence among American cities obtained by Chicago" was in 1893 "regarded by nine-tenths of the population not interested directly in commerce as a nuisance to be abated."

Captain Marshall was outspoken in reference to the use of the river for waste disposal. "... No improvement in (the) Chicago River should be made by the general government: nor any public funds be expended thereon so long as the City of Chicago uses it as a dumping ground for its filth and refuse of all kinds. The city should be required to remove all deposits made therein that tend to diminish its present navigable capacity, or to cease depositing its sewage therein." The drainage canal being constructed at that time by the Chicago Sanitary District from Chicago to Lockport would help but not entirely solve the problem of waste in the Chicago River, explained Captain Marshall, by making possible a discharge from the Chicago River to the Des Plaines River of from 300,000 to 600,000 cubic feet of water per minute (5,000 to 10,000 cubic feet per second). The Chicago River, Captain Marshall believed, could not provide a channel for more than a fraction of this discharge "without producing currents that will be prohibitory to navigation at some of the bridges and obstructions now existing."¹¹

Captain Marshall's outspoken comments on the condition of the Chicago River were prompted by the River and Harbor Act of 13 July 1892 which in making appropriations for improving the harbor at Chicago directed that the engineer in charge of the harbor, in his next report, submit what, if any, improvements should be made on the Chicago River. His recommendations specified that, as far as existing wharves and docks permitted, the Chicago River as far as the stockyards on the south branch, and to Belmont Avenue on the north branch, be dredged to admit vessels drawing 16 feet of water; and that all encroachments on the Chicago River within the original banks of the stream which were obstructive to navigation be removed at the expense of the encroaching parties and that alterations to obstructive bridges be required.

Dredging which involved the removal of some 1,200,000 cubic yards of material and docking or shoring up the banks of the river for some 8,000 linear feet would cost about \$700,000. As long as sewage was dumped in the river by the City of Chicago, the city, Captain Marshall believed, should perform the dredging required to maintain the channel once it had been deepened by the Federal Government. Even a discharge of 250,000 cubic feet per minute by the Sanitary District through the south branch of the river would require wholesale modification of bridges, tunnels, docks, and a widening of the river as well as a deepening to at least 18 feet, all of which would cost an estimated \$6 million.

Congress, in the River and Harbor Act of 1894, authorized the Secretary of War to expend up to \$25,000 in improving the Chicago River to the fork. In 1896 Congress followed the recommendation of Major Marshall to dredge the river to 16 feet as far as the stockyards on the south branch and Belmont Avenue on the north branch, and appropriated \$50,000 to begin the dredging. In all, Congress authorized \$650,000 for the 16-foot channel project. It was completed in 1899.

Major Marshall, in 1898, warned that since the city of Chicago deposited a daily probable average in excess of 1,000 cubic yards of waste in the river, even after the matter in suspension was carried away, benefits from work accomplished on the 16-foot project would disappear in 4 years unless \$35,000 to \$50,000 a year was spent in maintaining the channels. Congress had not provided maintenance funds as it was anticipated that maintenance dredging would be the responsibility of the city of Chicago.¹²

An act of 1 July 1898 made funds available to pay expenses of acquiring title to lands needed for widening the Chicago River at obstructive bends and projecting docks. Major Marshall had in his

annual report of 1897 submitted maps showing the profiles and crowns of the LaSalle Street and Washington Street tunnels, maps of all the bridges over the Chicago River which prohibited passage by the largest lake vessels, and maps of the short bends in the river which were impossible for such vessels to navigate.

In 1889, 11 million tons of cargo had moved in and out of the Chicago Harbor. Tonnage moved in 1907 was less than half this figure, that is, about 5 million tons. The shift of lake trade to the less congested Lake Michigan harbors, particularly to the South Chicago Harbor at Calumet, was already noticed by Captain Marshall in 1893. "Some establishments," he said, "have moved to South Chicago, and Waukegan and Milwaukee have also profited at the expense of Chicago."

Corps of Engineers improvement of the Calumet River had begun with appropriations in 1886 and 1888 which provided for dredging the river to a 16-foot navigation depth and widening it to 200 feet from its mouth to a point one-half mile east of Hammond, Indiana. The work was divided into two sections, one, from the river's mouth to the forks of the Calumet River at the outlet of Hammond, Indiana. Little progress had been made by 1893 on the second section. The work there, Captain Marshall reported, "... has been worse than useless as the channels excavated have filled up rapidly by slaughterhouse refuse and filth from manufacturing establishments and solid matter from the sewage poured into the dead stream."¹³

The original 16-foot project had been essentially completed by 30 June 1892 on the 3½ mile stretch of river up to Lake Calumet except for a short stretch of hard pan and rock, but by 30 June 1893 much of this channel was again filling in. Some dredging would be necessary annually. Above the mouth of the Little Calumet River dredged channels were equally impermanent and, since much of what was dredged was filth deposited in the Calumet River, "The United States," Captain Marshall maintained, "are simply the scavengers for this vicinity."

Nevertheless, the improvement of the Calumet River had evidently stimulated the commerce of the port of South Chicago and the improvements were worthy, Captain Marshall believed, of the continued aid of Congress. By 1895 Major Marshall found that a 16-foot channel on the Calumet would soon be insufficient and that a 20-foot channel would be required.

New enterprises were growing up annually along the banks of the Calumet River. One company in 1895 was soon to have the capacity to store over 4 million bushels of grain. In the same year the

MAP OF

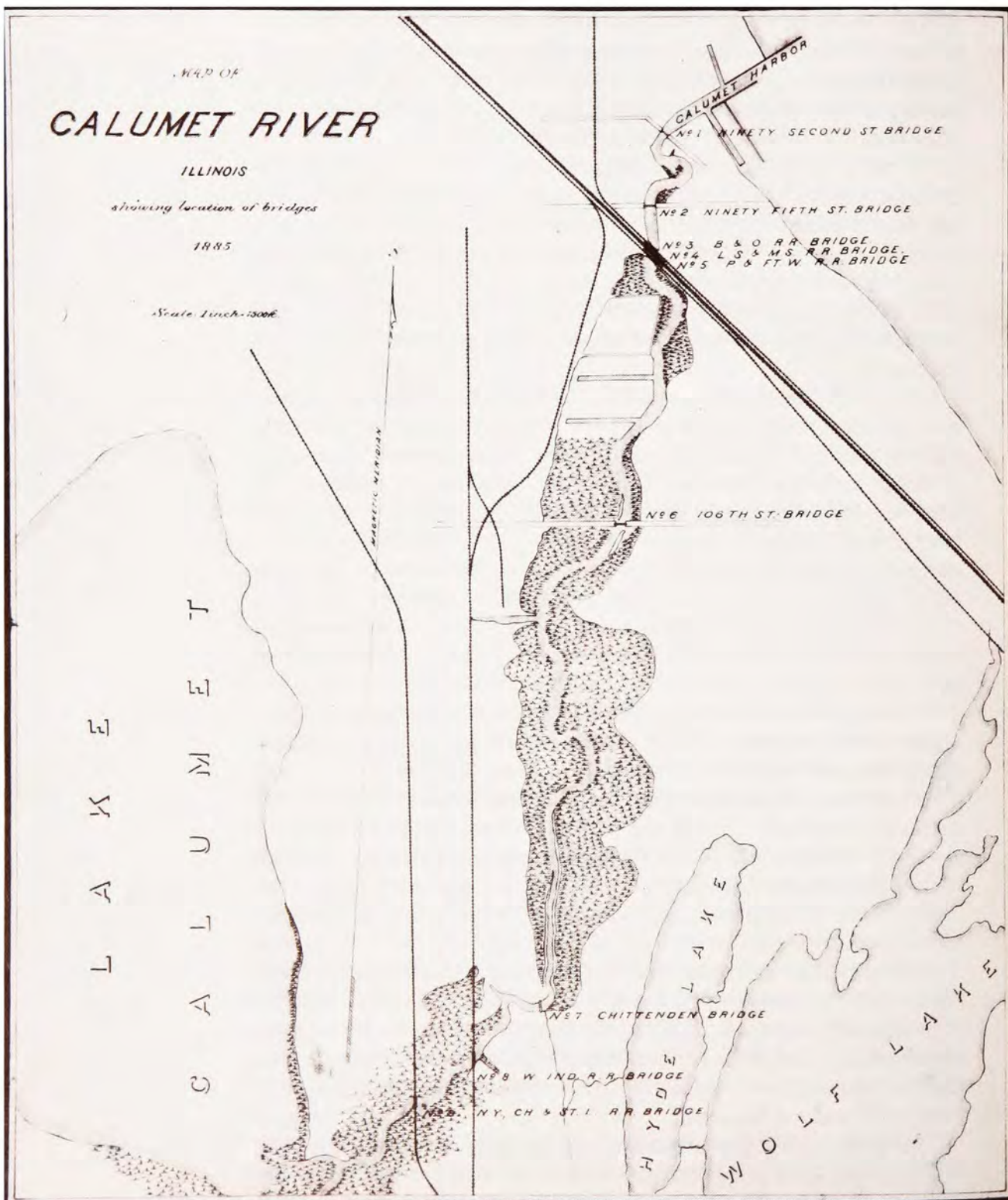
CALUMET RIVER

ILLINOIS

showing location of bridges

1885

Scale, 1 inch = 1000 ft.



Chicago Shipbuilding Company completed building three steel vessels for freight service while three more were in the stocks and soon ready to be launched. In 1895 the Joy Morton & Company received 100,000 tons of salt by lake vessels at its docks on the Calumet River. Most of the enterprises of any size on that river were located within 2 miles of Lake Michigan. There was ample room for further development. In 1895 and for some time thereafter as much as two-thirds of the frontage of the river was still vacant.

In 1895 Major Marshall recommended that the Calumet River be dredged to a depth of 20 feet for 2 miles southward from the mouth and Congress in the river and harbor act of 1896 made it possible for that recommendation to be carried out. In 1899 Major Marshall could report that "The capacious channel (of the Calumet) river continues to attract industries dependent on cheap transportation of crude and bulky articles, but still a comparatively small extent of available dock and wharf room is now utilized. . . ." ¹⁴

In 1899, after 11 years at Chicago, Major Marshall was relieved of his responsibilities there. The questions he had raised concerning the Illinois waterway, the Chicago River, the Chicago Sanitary and Ship Canal, and the Calumet River and Harbor remained matters of concern during the first decades of the new century.

Other than maintenance dredging, removing snags, and repairing equipment, very little was undertaken by the Federal Government to improve navigation on the Illinois River in the early years of the 20th century. In 1904 the Secretary of War authorized the Sanitary District of Chicago to lower the Federal dams at Kampsville and La Grange by 2 feet. This work was carried out between 1905 and 1907.

In 1907 Congress appropriated \$100,000 for establishing a 7-foot depth on sections of the Illinois River above and below Copperas Creek. Additional funds were made available in subsequent years and in 1916 work was continuing toward the establishment of a 7-foot navigation channel on the Illinois River. In that year some 240,000 tons of freight, with an estimated value of \$3,700,000 were moved on the river. By far the most significant cargoes were livestock, 28,490 head valued at \$1,200,000, and grain, 1,700,000 bushels valued at \$1,500,000.

The Sanitary District of Chicago requested a permit from the Secretary of War to connect the drainage canal with the west fork of the south branch of the Chicago River in April 1899. A temporary permit authorizing the diversion of water from Lake Michigan via the Chicago River into the drainage canal was granted on 8 May 1899, but the Secretary of War reserved the right to stop the discharge of the river through the canal or to modify it if this should be necessary in the

Facing page:
The Calumet River and
surrounding territory in
1885 before development
by the Federal Govern-
ment.

interests of navigation. Although the permit did not specify any particular volume of water that might be diverted it implied a volume not exceeding 5,000 cubic feet per second (300,000 cubic feet per minute) and a velocity not to exceed 1.25 miles per hour. The actual limit of the discharge allowed under the permit was the point at which the "flow may become unreasonably obstructive to navigation or injurious to property."¹⁵

The entire question of turning the Chicago River around, of drawing water from Lake Michigan and discharging it through the drainage canal into the Des Plaines and Illinois Rivers, was recognized by the Chief of Engineers as important to the city of Chicago but, as the Chief Engineer pointed out, "there were also questions involved of equally great importance to the lake navigation interests both of the United States and Canada." No one knew in 1899 what the effect of drawing water from Lake Michigan on lake levels would be.

A new War Department permit to the Sanitary District of 9 April 1901 limited the 5,000 cubic feet per second discharge to the hours of 4 p.m. to midnight and otherwise allowed a discharge of 3,333 cubic feet per second (200,000 cubic feet per minute). This permit was replaced in December 1901 with one that allowed 250,000 cubic feet per minute throughout the entire day. On 17 January 1903 a larger flow, 350,000 cubic feet per minute (5,833.3 cfs), was allowed during the winter when navigation was closed until 31 March 1903. Thereafter the limit was again 250,000 cubic feet per minute (4,111 cfs).

In 1906 the Sanitary District of Chicago claimed a population of 1,500,000. An act of the State of Illinois of 29 May 1889 required of the Sanitary District a flow of 20,000 cubic feet per minute (333 cfs) for each 100,000 inhabitants of the district and required a flow of 300,000 cubic feet per minute for the 1,500,000 people in the district. The volume of water allowed by the War Department was less than required by Illinois State law and, since the population was expected to grow, it was anticipated that there would be increased pressure to permit greater drawoffs from Lake Michigan.

In addition, since the Sanitary District considered the results of the drawoff a satisfactory way of getting rid of the sewage, there were plans to expand the system. A secondary sanitary canal was to be completed along the approximate line of the old Calumet feeder for the Illinois and Michigan Canal. The State of Illinois had in a 1903 amendment to the Sanitary District act of 1889 given the Calumet feeder and State lands adjacent to it to the Sanitary District for the construction of the auxiliary sanitary canal. Work was begun on the Calumet Sag Canal in 1911 and completed in 1922.

The Calumet Sag Sanitary Canal was intended to take sewage from South Chicago, Illinois, and East Chicago, Indiana. For this canal to be effective for sanitary purposes a flow of 4,000 cubic feet per second from Lake Michigan was required and this flow would only be adequate for a few years.

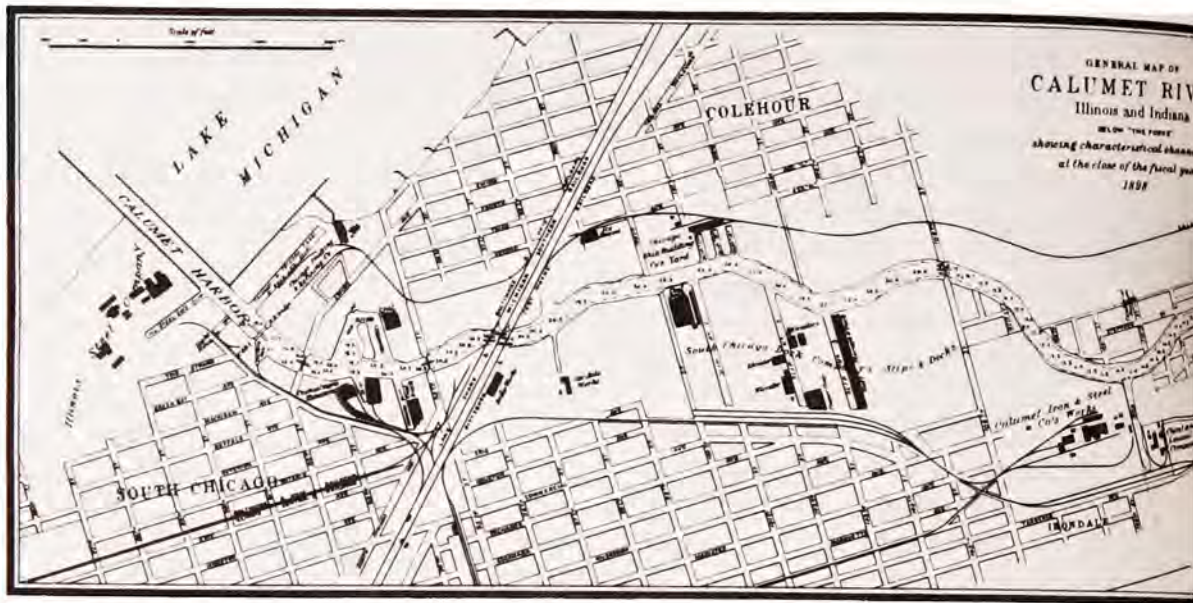
Between 1907 and 1910 the Sanitary District constructed a third sanitary canal called the North Shore Canal. It extended from Lake Michigan at Wilmette in a southerly direction 6.14 miles to the north branch of the Chicago River at Lawrence Avenue. A lock with a depth of 13 feet and a chamber 28 feet wide and 140 feet long was built at the Wilmette or Lake Michigan end of this canal permitting small boats to pass from the canal to a harbor constructed by the Sanitary District. Water supply for the canal was obtained by pumping from the lake at Wilmette.

Lieutenant Colonel William H. Bixby, Chicago District Engineer (1905-1908), reported on 22 May 1906 that other towns and cities on the lake in northern Illinois and southeastern Wisconsin were thinking of setting up pumping stations along the lakefront and of pumping their sewage into tributaries of the Des Plaines and Fox Rivers. Colonel Bixby anticipated that at least 20,000 to 30,000 cubic feet of water per minute would need to be drawn from the lake to meet future requirements if these plans were realized.

Based on studies by United States Lake Survey described in the Chief of Engineers' annual reports of 1900 and 1904, Colonel Bixby estimated in 1906 that a steady flow from Lake Michigan of 30,000 cubic feet per second would reduce Lake Michigan and Lake Huron by 8.9 inches. However, if such an outflow persisted beyond 5 years the surface of these lakes would be lowered by 1½ feet.

On 14 March 1907 the War Department, reflecting growing concern of other lake states for the securing of lake navigation, denied the Sanitary District of Chicago permission to reverse the flow of the Calumet River so that the waters of Lake Michigan would flow into the drainage canal. However, on 30 June 1910 the Secretary of War did issue a permit to the Sanitary District to reverse the flow of the Calumet River on condition that the total flow through both the Calumet and Chicago Rivers would not exceed 250,000 cubic feet per minute (4,111 cfs).

Although War Department permits to withdraw water from Lake Superior continued to be issued, they were always given on the condition that the velocity of the river should not exceed 1½ miles per hour. So as to increase the flow without exceeding the permitted velocity the south branch of the river was widened and deepened by



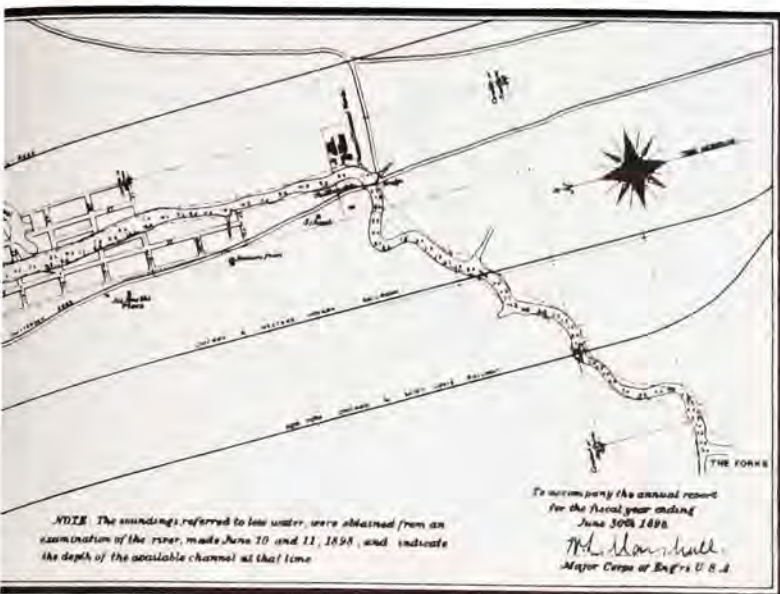
The Calumet River in 1898. After the adoption of the project for improvement by the Federal Government the surrounding territory experienced remarkable growth as an industrial center.

the Sanitary District from Lake Street to Damen Avenue (formerly Robey Street), a distance of about 5 miles. This work was carried out between 1899 and 1914 and involved dredging to a depth of from 21 to 26 feet and to a width of 200 feet, as well as the replacement of 14 bridges. The project cost the Sanitary District about \$12,600,000.

Under the supervision of Chicago District Engineer Major Joseph H. Willard (1899-1903) the removal of obstructing bends and docks made possible by funds appropriated on 1 July 1898 was completed. In all, 106,848 cubic yards of land and old docks had been removed and 4,893 linear feet of new dock was constructed.

In 1902 Congress authorized the use of \$500,000 for the construction of two turning basins on the Chicago River. No work was done on the Chicago River in 1903 by the Federal Government but in 1904 under the direction of Chicago District Engineer, Lieutenant Colonel Oswald H. Ernst (1902-1904), 19 tracts of land were secured for the construction of the turning basins, one on the south branch at the junction of the south and west forks and the other on the north branch near the head of Goose Island. In that same year an act of Congress of 27 April declared three tunnels under the Chicago River to be unreasonable obstructions to free navigation and authorized the Secretary of War to give notice to their owners to alter them. On 9 September the Secretary of War ordered the tunnels altered so as to have at least 22 feet of water over them.

Work on the two turning basins which was carried out under the



direction of District Engineer Colonel Bixby (1902-1908) was completed in 1907. Work on lowering of the tunnels obstructing navigation on the Chicago River was carried out by their owners in 1906 and 1907. In the latter year Congress, by an act of 2 March, appropriated \$300,000 for dredging the Chicago River to 21 feet at mid-channel to within 20 feet of the dock line from the Ogden slip at the mouth of the river to Ashland Avenue on the south branch, to the Belt Line Bridges on the south fork of the south branch, and to Belmont Avenue on the north branch. Dredging to 21 feet was carried out under the direction of District Engineer Major Thomas H. Rees from 1909 to 1910 and continued until 1912 at which time Lieutenant Colonel George A. Zinn was District Engineer. As early as 1910 it became necessary to start redredging to maintain the 21-foot depth in areas where it had been established only a year earlier.

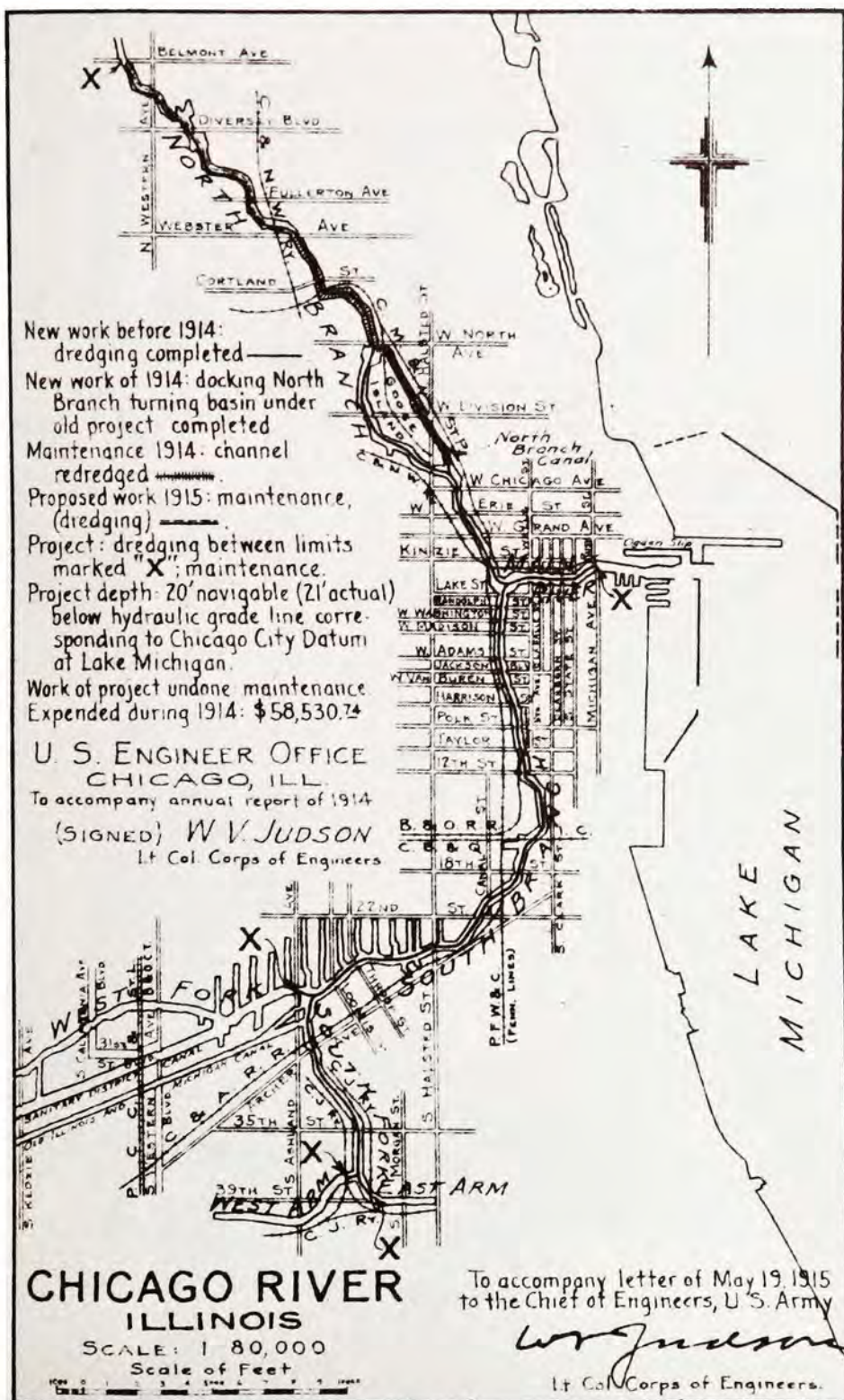
During the period 1899-1916 Chicago District Engineers were also responsible for improvements for navigation on the Calumet River. There the project included the construction of turning basins and extending the 20-foot navigational depth up river until by 1912 a 21-foot depth was available as far as Lake Calumet.

The Calumet Sag Canal proposed by the Sanitary District was to be 16½ miles in length and to run from the main drainage channel near the Sag bridge to the Little Calumet River. It was to be 20 feet in depth, 60 feet wide through rock, 36 feet wide at the bottom and 116 feet wide at the water line through earth sections. Lieutenant Colonel

Zinn saw the advantages once the Sag channel was completed of improving the Little Calumet River so that traffic could pass from Lake Michigan to the Illinois River. In 1913 the Board of Engineers for Rivers and Harbors did not, for reasons explained below, consider it advisable for the United States to improve the Little Calumet River.

When on 11 August 1913 Chief Engineer Brigadier General William H. Bixby forwarded to the Secretary of War a survey of the Chicago Harbor and adjacent waterways begun by Major Rees and completed by Colonel Zinn, he expressed his conviction that it was not advisable for the United States to undertake new projects on any of the interior waterways in the Chicago area "until at least such time as one or more of them shall form a through system of waterways, freed as far as possible from the obstructions to navigation caused by municipal requirements." This policy had the full support of the Board of Engineers for Rivers and Harbors which on 30 July 1913 had advised the Chief Engineer that, while it believed additional improvements of the Chicago and Calumet Rivers to be desirable from the commercial point of view, it did not consider them proper objects for national expenditure. The government, the Board believed, should confine its work at lake ports to construction of breakwaters and entrance piers and to necessary dredging in the outer harbors.¹⁶

Although extensive maintenance dredging was carried out in 1916 to restore stretches of the Chicago and Calumet Rivers to the 21-foot depth which had been established earlier, except for emergency work during World War I, it was many years before new Federal projects were considered for these rivers.



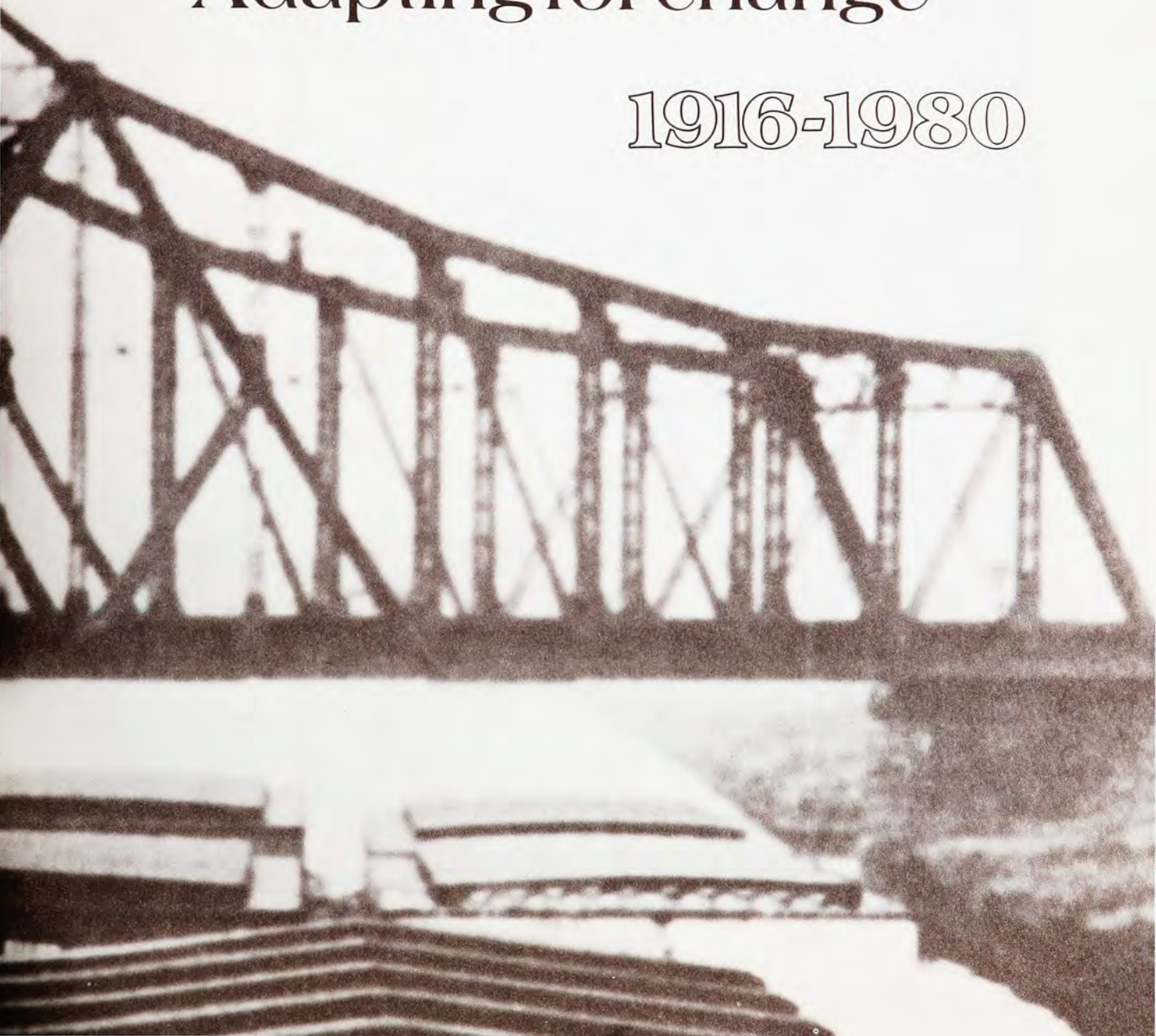
The Chicago River as it was in 1914. Parallel to the old Illinois and Michigan Canal the Chicago Sanitary and Ship Canal connected the South Branch of the Chicago River with the Des Plaines River, thereby reversing the flow of the Chicago River so that its polluted waters no longer flowed into Lake Michigan.

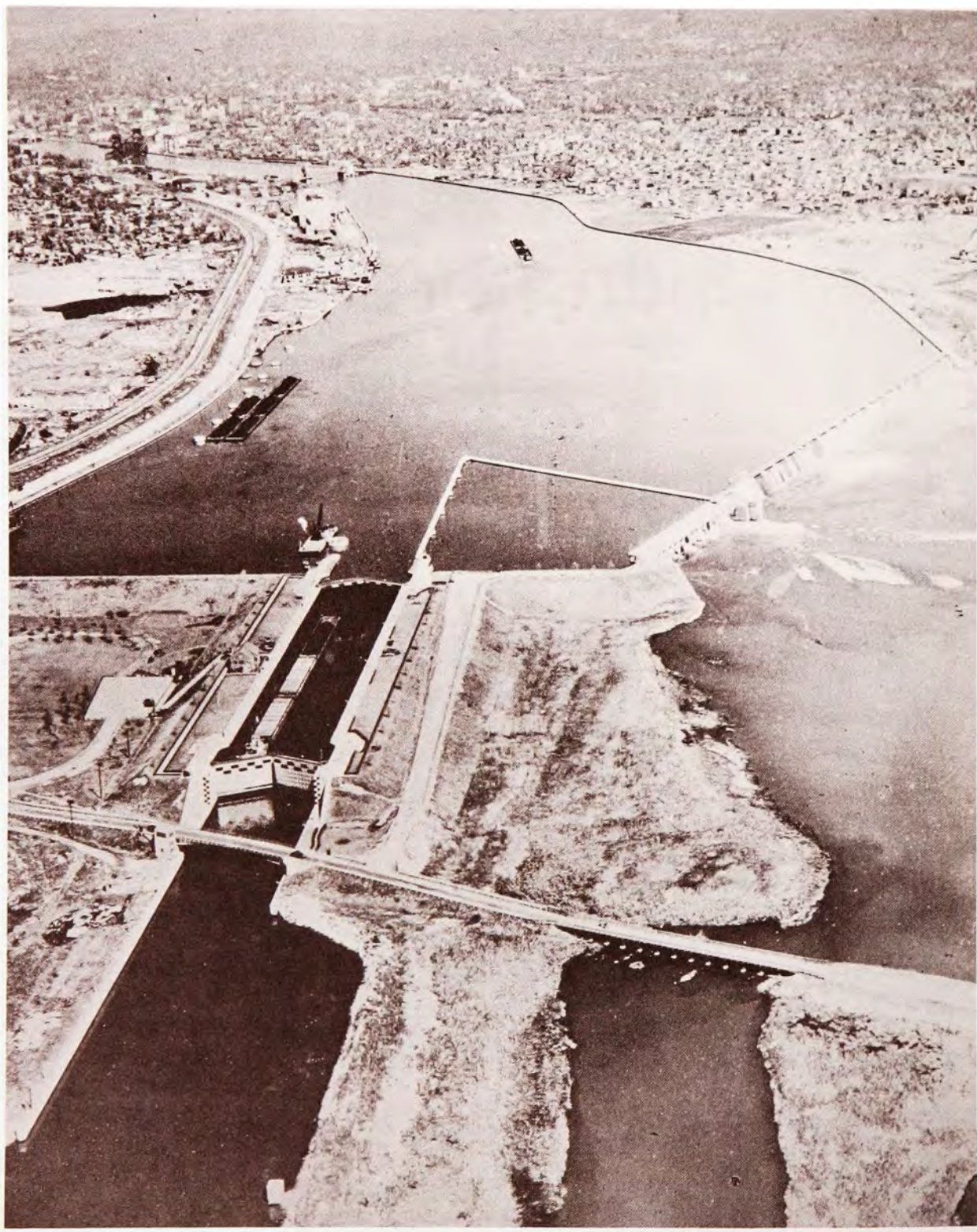


Part Three

Adapting for change

1916-1980





Chapter 1



The Illinois Waterway becomes a Federal project

The original Illinois Waterway was not the Federal project we know but a State of Illinois undertaking which included only that 60-mile portion of the present waterway above Utica on the Illinois River and below Lockport on the Des Plaines River. Downstream it connected with the Federal project which, after the river and harbor act of 2 March 1907, included 235 miles of the Illinois River from LaSalle to its mouth at Grafton. On this stretch of the river, until 1927, the Corps of Engineers worked to obtain and secure a 200-foot wide channel with a 7-foot depth at low water (1901). Upstream at Lockport the State project joined the main Chicago Sanitary and Ship Canal which provided adequate depth for riverboats and barges for about 30 miles to the South Branch of the Chicago River 6.2 miles from Lake Michigan. From a point 12.4 miles above Lockport on the main canal, the Calumet Sag Channel extended 16.2 miles to the Little Calumet River just east of Blue Island where a lock 50 by 360 feet was used primarily to regulate the flow of water and secondarily for navigation.

In 1908 the people of Illinois, by popular vote, authorized the State to spend \$20 million improving the 60-mile stretch between Lockport and Utica. This was the original Illinois Waterway. It was 1913 before the State submitted its improvement plan to the War Department. It called for enlarging the old Illinois and Michigan Canal by widening it to 36 feet at the bottom and deepening it to 8 feet from Joliet to Dresden Island, about 1 mile below the confluence of the Des Plaines and Kankakee Rivers. From Dresden Island to Starved Rock, the plan called for using the channel of the Illinois River except

Facing page:

The Brandon Road Lock and Dam at Joliet, Illinois, on the Illinois Waterway was originally one of 5 planned and partly constructed as a State of Illinois project on the 60-mile stretch reaching from above Utica on the Illinois River to just below Lockport on the Des Plaines River. This structure was about 70 percent complete when Congress authorized the Federal Government to take over the State project in 1930.

The Illinois
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for a 2½-mile canal around the rapids at Marseilles. The proposed locks were to be 55 feet wide and 200 feet long except for one lock 45 feet wide and 250 feet long.

Dimensions of the proposed locks were considered inadequate by the War Department which declined to issue a permit for the project unless specifically authorized to do so by Congress. Congress took no action. However, in 1919 the State passed a new act with revised plans which no longer called for enlargement of the old Illinois and Michigan Canal but for improvement of the channels of the Des Plaines and Illinois Rivers by means of dams and five locks, each 110 feet wide and 600 feet long, constructed in the natural beds of these streams except for the 2½-mile reach around the rapids at Marseilles where the idea of providing a canal was retained. This plan was acceptable to the War Department and a permit was issued to the State on 6 May 1920. Construction began in 1921.

By 1930 the State had spent about \$15½ million completing 75 percent of the project structures. There were five major structures. The first in the series, proceeding downstream from the Sanitary Canal, was the lock at Lockport which was 95 percent complete. The new State lock was built adjacent to a smaller lock completed in 1910 by the Sanitary District to provide a connection between the Sanitary Canal and the lower stretch of the Illinois and Michigan Canal. Six miles below Lockport was the Brandon Road lock and dam which was about 70 percent complete. Here the dam presented a special problem in that it created a pool higher than the streets of the city of Joliet. To confine the pool, concrete retaining walls were built from the dam to a point near the upper limits of the city.

The Dresden Island Lock and Dam, 14 miles below the Brandon Road structure, was only about 20 percent complete by 1930. At Marseilles, 24 miles below Dresden Island, a 100-year old waterpower dam was being replaced by a higher dam, 95 percent complete by 1930. A canal 2½ miles long and 98 percent complete was excavated on the left side of the river to carry navigation from the pool above this dam to the Marseilles lock, after which it would return to the natural river channel. The last structure in the series was the lock and dam at Starved Rock some 16 miles below the Marseilles Dam and 1 mile above Utica. This structure was 95 percent complete. The Federal project began 600 feet below the lower lock of the State project.

By 1930, it had become evident that the \$20 million authorized bond issue for the State project would not be sufficient. Still unclear was the amount of dredging which would be required to establish the



8-foot depth called for in the State plan. How much dredging would be required depended on the flow of water through the system. It had been assumed that an average minimum flow of 6,000 cubic feet of water per second would be released into the State waterway at Lockport by the Chicago Sanitary District. A Supreme Court decree of 21 April 1930 limited the flow at Lockport to 6,500 cubic feet per second until December 1935 when it was to be reduced to 6,000 cubic feet. After 31 December 1938 the annual average was not to exceed 1,500 cubic feet per second. These limitations applied to water diverted from Lake Michigan to dilute sewage in the Chicago and Calumet Rivers but did not include water drawn from Lake Michigan for domestic purposes which, after use, found its way into the Sanitary and Ship Canal. This drawoff averaged about 1,700 cubic feet per second in the early 1930's. Anticipated construction by the Sanitary District of more effective purifying works for sewage treatment would make the diversion of large quantities of water from Lake Michigan for dilution of contaminated water in the Chicago and Calumet Rivers unnecessary.

An eight-barge tow locking through the Lockport Lock on the Sanitary and Ship Canal. The 40-foot rise here is the highest of the seven locks which together lift shipping on the Illinois Waterway from 327 feet above sea level at the Mississippi River to 549 feet at Lake Michigan. Water levels between Lockport and Lake Michigan are controlled by the powerhouse at the far left of the photo.



The Brandon Road Lock and Dam raises the level of water in the Des Plaines River so that it is higher than portions of the city of Joliet. To prevent flooding concrete retaining walls were constructed upstream of the dam. This photo is of special interest because it was taken before the Federal project was completed and a portion of the old Illinois and Michigan Canal can still be seen paralleling the river on the left.

Prior to the Supreme Court decree on diversion of water from Lake Michigan, Congress, on 21 January 1927, approved an act which provided for a channel 200 feet wide and 9 feet deep for the Federal project on the Illinois River from Utica to Grafton. The project was to be completed for less than \$3½ million and contemplated only minor alterations to the existing Federal dams at Kampsville and LaGrange. It also provided for the transfer of the State owned dams at Henry and Copperas Creek to the Federal Government. The State dams had been drowned out as a result of the additional flow from Lake Michigan through the Sanitary and Ship Canal. They were transferred on 28 March 1928 and were partially removed later that year. During high water the two Federal locks were also unnecessary since riverboats and barges of the mid-1920's with a draft of 6 feet or less could proceed directly over the dams at high water.

Like the State project above Utica, the carrying out of the new Federal project was complicated by the uncertainty as to the amount of water which would be released into the system at Lockport.

Lieutenant Colonel William C. Weeks, who as District Engineer of the Chicago District was given responsibility for improvement of the Illinois River on 4 August 1928, concluded that in view of the limited funds made available by Congress, the interests of the United States and of prospective commerce on the Illinois River would best be served by dredging and open river navigation instead of slack-water navigation utilizing locks and dams. The Chief of Engineers found that this recommendation was not in accordance with the authorized project which had anticipated using the LaGrange and Kampsville dams as well as dredging to establish the 9-foot navigation depth. Though dredging was commenced in 1929, only temporary expedients were taken to make the dams more effective. The Board of Engineers then recommended to the Chief of Engineers on 16 November 1929, "... that further consideration of permanent plans for a 9-foot depth be deferred until the expected Supreme Court decision (regarding diversion from Lake Michigan) has been rendered."¹

Within weeks of the Supreme Court decree of 21 April 1930 limiting diversion of water from Lake Michigan, Congress, on 3 July 1930, authorized recommendations made in 1929 by the First Chicago District Engineer, Colonel Weeks, extending the Federal project, which had ended at Utica, upstream to the heads of the Federal projects on the Chicago and Calumet Rivers.

In 1929 the Chicago District was divided into the First and Second Districts. The First Chicago District included the Illinois River and the rivers and streams within its watershed boundaries. This District reported to the Upper Mississippi Valley Division. The Second Chicago District was in charge of Great Lakes projects and was under the jurisdiction of the Great Lakes Division. In 1933, the two Districts were combined again, but they continued reporting to the two different Divisions.

The Federal project would now include the State project, the original Illinois Waterway, and would extend through the canals of the Sanitary District. For the first time a single authority, the Federal Government, was responsible for the entire waterway from Lake Michigan to the Mississippi River.

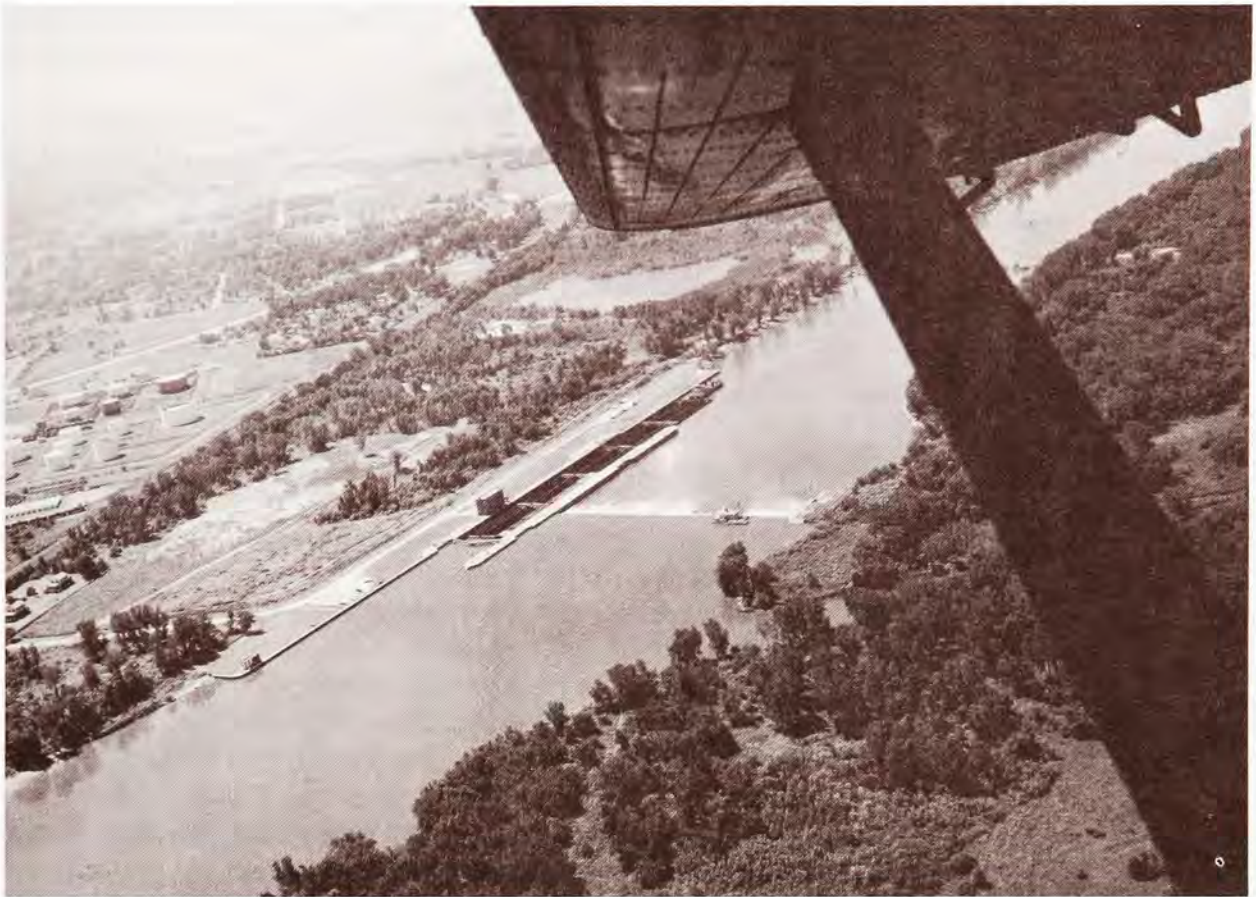
The State of Illinois, unable to raise the additional funds required to complete the waterway without again submitting the matter to a vote of the people, had proposed relinquishing its rights in the waterway to the Federal Government. The State was to use the funds remaining from its \$20 million bond issue for construction and alteration of bridges and for such works as the remaining funds would



LaGrange Lock and Dam on the Illinois Waterway. Federal locks and dams near LaGrange and at Peoria were authorized by Congress in 1935 and completed in 1939. The locks are used only when water levels are normal or lower. When the water is high the dams can be lowered and river boats and tugs save time by passing over them without using the locks.

permit. Congress made \$7½ million available for completion of the former State waterway in December 1930. Contracts for completion of the masonry and steel of the locks and dams at Brandon Road and Dresden Island were awarded in February 1931. Construction work was commenced early in the spring. Later, contracts were awarded for completing construction of the Marseilles Dam; providing electric equipment, control houses and machinery shelters at all of the locks; accomplishing extensive rock and earth excavation in all of the pools; raising roads and dikes; and providing additional drainage facilities in certain areas and miscellaneous items such as clearing of all lands subject to overflow.²

By March 1933 the waterway was opened to navigation although the full width of the channel was not completed until that summer. It was formally dedicated by the Secretary of War, George H. Dern, on 22 June 1933, when the first tow of barges from New Orleans arrived at the Michigan Avenue Bridge in Chicago.³



A channel 9 feet deep and 200 feet wide had been achieved by dredging on the 231-mile stretch between Starved Rock and Grafton. The Federal locks and dams at Kampsville and La Grange were still in place, but the locks were too small to accommodate large tows, and the dams were too low to provide slack-water improvements. The 9-foot depth which had been achieved was only temporary for it was dependent on the still rather large augmentation of flow by diversion from Lake Michigan. A plan was needed whereby this depth could be economically maintained independent of any but the maximum diversion of 1,500 cubic feet per second to be allowed after 1938.

Such a plan was developed by Colonel Daniel L. Sultan who was Chicago District Engineer from 6 January 1932 to 30 June 1934. Colonel Sultan was born in Oxford, Mississippi, in 1885, and it is said that his grandfather refused to see him when he called in the uniform of a West Point cadet. He graduated ninth in his 1907 class at the Military Academy and in 1916, as a captain in the Corps of Engineers, he was

Peoria Lock and Dam on the Illinois Waterway.

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sent to the Philippines and placed in charge of constructing fortifications on Corregidor which later gave evidence of his engineering skill by resisting overwhelming attacks during World War II.

Colonel Sultan's plan for the Illinois Waterway provided for a depth of 9 feet and a 300-foot width for the entire project below Lockport. Since locks and dams would be necessary with a diversion of no more than 1,500 cubic feet per second from Lake Michigan, he recommended two locks 110 feet wide and 600 feet long and movable dams on the Illinois River between LaSalle and Grafton. The locks and dams were to be located near LaGrange and at Peoria. The old LaGrange and Kampsville locks and dams were to be removed. A third dam, not on the Illinois River but on the Mississippi River at Alton, Illinois, would provide the required depth on the lower stretches of the Illinois River as far as the proposed dam at LaGrange, 80.2 miles upstream. The Alton Dam would eliminate the necessity of rebuilding the old lock and dam at Kampsville.⁴

The Chief of Engineers recommended these improvements, estimated to cost about \$15½ million, in December 1933 and the project was authorized by the River and Harbor Act of 30 August 1935. The LaGrange and Peoria locks were built while Arizona born, Lieutenant Colonel Donald H. Connolly, a 1910 graduate of the Military Academy, was Chicago District Engineer (1 July 1934-30 June 1938). The locks are used for navigation only during low and normal flows when the chanoine wicket dams are raised to maintain the minimum channel depth of 9 feet above the locks. During high flows when a channel depth of 9 feet is possible without raising the dams, open river conditions prevail and navigation passes over the lowered dams without using the locks. The dam at Alton, Illinois, was opened to navigation in 1938.

The reopening of navigation between Lake Michigan and the Mississippi River in March 1933 stimulated consideration as to which harbor would make the most suitable Lake Michigan terminal for Illinois Waterway barge traffic. The route via the main drainage canal and the Chicago River afforded a channel with a minimum width of 160 feet but passed through the congested business district of Chicago. The route via the Sag Channel afforded a usable width of only 60 feet for barges of 9-foot draft but did not pass through congested areas. From the eastern end of the Sag Channel it followed the Little Calumet River 6.4 miles to the Calumet River and through that river to Calumet Harbor on Lake Michigan. It was a problem reminiscent of those considered by Captain William L. Marshall in his report of 1890 in which he favored development of a



route to the lake terminating at Calumet or South Chicago rather than at Chicago. Between January 1931 and December 1933 a special board of engineers including First Chicago District Engineer Colonel W. C. Weeks, who was replaced in January 1932 by his successor Lieutenant Colonel Daniel I. Sultan, considered the alternatives and, like Captain Marshall, came to the conclusion that "The Calumet-Sag route offers greater possibilities for a more satisfactory through water route (than the Chicago River) to the Great Lakes..." The board, however, could not find sufficient benefits to justify the expenditure required to convert the Calumet Sag route into the main connection.⁵

The Chief of Engineers, Major General Edward M. Markham, who from 1929 to 1932 had been in charge of the Corps Great Lakes Division, emphasized that improvement should take place over a period of time, as traffic developed. As first steps to the ultimate development of the Calumet Sag route, he advised that a channel be provided from the head of deep-draft navigation on the Calumet River to the eastern end of the Sag Channel, that three passing places, 9 feet deep and 150 feet wide, be dredged along the Sag Channel and, to provide a transfer terminal, areas be dredged at the entrance and south end of Lake Calumet.⁶

A close-up photo made during construction of a portion of a movable wicket dam of the type installed at LaGrange and Peoria in the late 1930's.

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On 10 May 1934 the House Committee on Rivers and Harbors requested the Board of Engineers to report on the costs of constructing and maintaining channels not only in the Sag Channel and the Calumet and Little Calumet Rivers, as recommended by General Markham, but also in the Grand Calumet River and the Indiana Harbor Canal. The matter was referred for study to the District Engineer at Chicago, Lieutenant Colonel Donald H. Connolly, who, in this connection, held a public hearing on 20 November 1934. Over 100 people attended, most of whom expressed a desire for development beyond what had been advised by the Chief of Engineers. Nevertheless, when Congress dealt with the matter in the river and harbor act of 30 August 1935, it authorized the more modest project. The total cost for the new work was about \$3.3 million. The project was completed in 1939.

Commercial statistics were not compiled for the Calumet Sag route before 1932, but in that year 67,000 tons of freight valued at \$75,835 was moved through the channel. Commerce there grew steadily throughout the decade and by 1940 had increased more than 1,200 percent, to 885,056 tons. By 1944 commerce on the Calumet Sag Channel exceeded 1 million tons.

Through commerce on the main Sanitary and Ship Canal was about 62,500 tons in 1933 and 100,000 tons in 1934. It consisted of a wide variety of products. Local traffic, largely in limestone, sand, gravel, gasoline and oil, amounted to about 420,000 tons in 1933 and 862,000 tons in 1934.

There was no commercial navigation from Lockport to Starved Rock until 22 June 1933 when the first through tow from New Orleans arrived in Chicago. At first, use of the waterway was badly obstructed by 12 highway and 5 railroad bridges, but the State of Illinois undertook to remodel and rebuild these bridges so they would not interfere with navigation.

During the 1920's there was little commercial navigation on the Illinois River. The total per year varied from 100,000 to 200,000 tons of freight and 10,000 to 20,000 passengers. The lockages at La Grange and Kampsville taken together amounted to 963 for June, July, and August in 1930, or about 150 per month for each structure. By 1932 traffic had not greatly increased and totaled 188,180 tons while the number of passengers was 85,800, but by 1935 commercial navigation on the Illinois River had increased to 620,000 tons. For the entire Illinois Waterway about 1½ million tons were recorded in 1935, 3 million tons in 1940 and over 6 million tons in 1944.

The predominant direction of traffic on the Illinois Waterway was upbound and included coal from the vicinity of Havana, Illinois, des-

tined for use in electric generating plants in the Chicago region. Sulfur originating in Louisiana and Texas was brought to Chicago where considerable tonnage was transferred to lake vessels. Most of the grain brought to Chicago in the early 1940's was loaded between Morris and La Salle, below which most of the grain was shipped to St. Louis. Some petroleum products moved from various points on the middle and lower Mississippi River to either Peoria or into the Chicago region but the bulk of petroleum products tonnage was moved from refineries near Lockport, where crude oil was received by pipeline, through Calumet Harbor to Indiana Harbor and other lake ports.

"A controlling consideration," Chief of Engineers Major General Edward M. Markham had written in 1933, "in the improvement of waterways in this highly developed region is the provision of bridges which will afford suitable clearances for navigation at reasonable cost and without unreasonable obstruction to rail and highway traffic."⁷ General Markham's observation held true throughout the future decades of Illinois Waterway history.

All of the individual waterways which make up the Illinois Waterway upstream from Lockport were spanned by numerous bridges, many of which had inadequate horizontal and vertical clearance for the convenient passing of river barge traffic. In 1933, 32 drawbridges crossed the Chicago River between the lake and the Drainage Canal. When closed most of the highway bridges provided a clearance of from 13.5 to 16.5 feet depending on the lake levels. One railroad bridge offered a clearance of but 9.45 feet. Great traffic congestion occurred whenever the drawbridges were opened.

The Drainage Canal was crossed by 22 bridges offering a clearance of about 16.5 feet at low water. These bridges were built as drawbridges but by 1933 only a few of them had been equipped with operating machinery. The Calumet River was crossed by 15 drawbridges, most of which had little clearance with the draw closed, and the locations of some of them made passage of large vessels difficult. The Little Calumet River below the Sag Channel was crossed by 8 bridges, 2 of which were fixed with vertical clearances of 25.3 and 16.5 feet. The Calumet Sag Channel was crossed by 32 fixed bridges with a limiting clearance of 14 feet at low water. Altogether there were 54 bridges between Lake Michigan and Lockport on the route via the Chicago River and 61 on the route via the Calumet River.

The substantial increase in the use of the Calumet Sag route after completion of the modest improvements provided for in the River and Harbor Act of 30 August 1935 strengthened the case of those who



Some idea of the congestion and restriction of water transportation at Adams Street on the South Branch of the Chicago River is shown in this 1935 photo. The tugboat "Latin America" which is towing the two barges had a folding stack which enabled it to pass under bridges with small vertical clearance. A Chicago city ordinance limited tows to two barges lakeward of Western Avenue.

desired more thoroughgoing changes. The improvements desired, including removal or alteration of bridges and widening of channels, aimed at making the Sag Channel the main route to Lake Michigan. Indiana interests wished to add Gary, East Chicago and Hammond, Indiana, to the Lake Michigan harbors already acting as termini for the waterway.

By 1946 the Illinois Waterway provided a channel 300 feet wide, except for the 2½-mile canal at Marseilles, from Grafton to Lockport. Above Lockport the Sanitary and Ship Canal was at least 160 feet wide throughout while the Calumet Sag Channel offered a usable width of only 60 feet except for the three passing places, 150 feet wide and 3,800 feet long, added by the Corps of Engineers at the quarter points. The Little Calumet River had been widened to 300 feet from its junction with the Sag Channel to a turning basin for deep-draft lake craft and, where cargoes could be transferred from or to river barges, at Lake Calumet.

In a report of 1 June 1945 Chicago District Engineer Colonel Henry J. Woodbury, who supplemented his 1922 degree from the Military Academy with a degree in Civil Engineering from Cornell in 1927, recommended providing a channel width of 225 feet ultimately but 160 feet at first from just above Lockport on the Sanitary and Ship Canal to its junction with the Sag Channel and then through the Sag Channel and up the Grand Calumet River to deep-draft navigation on the Indiana Harbor Canal in East Chicago. A channel 160 feet wide was to be provided from the Indiana Harbor Canal to Clark Street in Gary. Instead of two terminal points for the Illinois Waterway on the Chicago and Calumet Rivers, the Grand Calumet River would be improved to facilitate the development of a network of channels to connect the urban and industrialized area at the southern end of Lake Michigan with the Illinois Waterway and the vast area tributary to the Mississippi River system.

Gary, with a population in 1945 of about 111,000, was one of the great steel producing centers of the world. East Chicago, including the community known as Indiana Harbor, had a population of about 54,000. It also had steel mills as well as petroleum refineries and allied heavy industry, most of which was located near the Indiana Harbor Canal. Hammond, with a population of 70,000, had about 74 manufacturing establishments, more numerous and diversified than the industry at Gary and East Chicago. All three cities actively promoted improvement and extension of the waterway.

The proposed extension of the Illinois Waterway up the Grand Calumet River would, Colonel Woodbury pointed out, require construction of a lock and control works on the river at a point downstream of its juncture with the Indiana Harbor Canal. The overall plan also called for replacing with a modern structure an unserviceable emergency dam which was a serious obstruction to navigation just above Lockport. The emergency dam was designed to protect Joliet and surrounding terrain in the event of a failure of either the Lockport Lock or of the side walls which had been built to confine the channel. There was no plan to further improve the route to the Chicago River via the Sanitary Canal beyond the Sag junction.

In his report on 1 June 1945 Colonel Woodbury recommended that all obstructive railroad bridges across channels for which he was proposing improvements be rebuilt or otherwise altered at government expense. Local interests should remove or reconstruct such highway bridges across these channels as were considered obstructions to navigation.⁸



After review by the Board of Engineers for Rivers and Harbors, Colonel Woodbury's plan was found acceptable by the Chief of Engineers and forwarded to the Chairman of the House Committee on Rivers and Harbors on 15 April 1946. On 24 July 1946 Congress authorized the project essentially as drawn up by the Chicago District Engineer. Except for providing duplicate locks, the subsequent history of improvement of the Illinois Waterway is largely the carrying out or, for some aspects of the project, the setting aside of the provisions of the 24 July 1946 act.

Between passage of the river and harbor act of 24 July 1946 and beginning of construction of the Calumet Sag improvements in 1955, commerce on the Illinois Waterway increased from about 7 million tons in 1945 to over 21 million tons in 1955. In 1945 commercial traffic on the Calumet Sag route was restricted to towboats which could pass under bridges which offered about 14 feet of headroom. These towboats ranged from 45 to 1,200 horsepower. A typical towboat was 57 by 16 by 8 feet and had 360 horsepower. Below Lockport the largest towboats operating on the Illinois Waterway were 167 feet long and 38 feet wide and had drafts of 7 to 8 feet.

By 1955, 35- by 195-foot barges had become standard on the waterway. The size of tows varied with the type of commodity and the portion of the waterway on which they were operating. Below Lockport 8 barges were common in a tow and the trend was toward 10 or more. Between the Brandon Lock pool at Joliet and Chicago by way of the Sanitary and Ship Canal, tows consisted of 2 to 4 barges. Lakeward of Western Avenue tows were limited to two barges by a Chicago city ordinance. Before widening of the Calumet Sag Channel, tows were limited to one or two barges. It was anticipated that, with the development of the Calumet Sag project, tows on the Waterway above Lockport and through the Sag Channel would consist of as many as eight barges.

By 1966 pledges had been received for all the items to be provided by local interests for part I or that portion of the Calumet Sag project pertaining to the channel from the Sag junction eastward to Lake Calumet. Congress appropriated \$4 million to commence part I in 1955 and construction began in the same year.

The burden placed on local interests to alter highway bridges which caused obstructions to navigation was relieved by the Truman-Hobbs Act of 5 July 1958 which authorized Federal funds to be used to alter highway bridges in much the same way as they were already used to alter railroad bridges.

Facing page:
Larger tows were permissible on the Drainage Canal. The twin screw steam tugboat shown in this 1938 photo had its home port in Mobile, Alabama and was equipped with folding stacks and a retractable pilot house to allow passage under low bridges. The width of this tow, 60 feet, left little horizontal clearance to spare at the railroad bridge.



Between 1955 and 1971 the Federal Government widened the 16.2 mile Calumet Sag Channel from 60 to 225 feet. This 1959 photo taken while work was still in progress shows the old restrictive width in the foreground contrasting with the improved stretch of the channel further back. Widening the channel involved removal of 1 million cubic yards of earth and stone for each mile of the project.

By 1972 the 14 railroad bridges over the Sag Calumet Channel had either been replaced or altered. Six street bridges had been removed without replacement and 15 of 17 highway bridges had been replaced or altered. By 1976 part I of the Calumet Sag modification to the Illinois Waterway was 97 percent complete. All that remained to be accomplished was relocation of one highway bridge and provisions for a lift on an additional highway bridge.

Bridge reconstruction, alteration, removal or rebuilding had cost more and had taken more time than widening the Calumet Sag Channel. This was accomplished by the spring of 1971. The project involved removal of 1 million cubic yards of earth and stone for each of the 16.2 miles of channel improvement. When widening was completed the Sag Channel offered a width of 225 feet for its entire length from Sag Junction through Blue Island.

In 1958 construction began on an additional segment of part I of the Calumet Sag Channel modification. This was the Thomas J. O'Brien lock and controlling works located on the Calumet River 7 miles downstream from the Sanitary District's lock and controlling



works at Blue Island. The O'Brien structure was completed in 1960 and has both navigation and sanitation functions.

The lock chamber, 110 feet wide and 1,000 feet long, permits the movement of barge tows comprised of 14 standard barges and a towboat without rearrangement before entering. During storm runoff the dam prevents reversal of the flow of water from the basins of the Little Calumet and Grand Calumet Rivers into Lake Michigan. For this purpose the O'Brien Lock and Dam is more effective than the old Sanitary District structure at Blue Island. The Federal lock and dam, 7 miles nearer to the lake, could control floodwaters carrying outfall from a Sanitary District sewage treatment plant and discharge of various industrial plants which, being lakeward of the Blue Island Dam, had flowed previously into Lake Michigan during flood stages.

Until 1965, the gates of the O'Brien Lock and controlling works were held open since the Blue Island Lock continued to be operated by the Sanitary District. On 1 July 1965 the Federal lock was placed in operation. Federal employees opened and closed the lock and sluice gates, except for navigation requirements, upon direction from

Before improvements began in 1955 the Calumet Sag Channel was crossed by 32 fixed bridges, such as the one shown in this 1957 photo, with a limiting clearance of 14 feet at low water. Bridge reconstruction, alteration, removal or rebuilding was more expensive and more time consuming than widening the channel, but by 1976 most of this work had been accomplished.

The Illinois Waterway becomes a Federal project

An idea of the full significance of widening the Calumet Sag Channel is obtained from these before and after photos from 1954 and 1962, both showing the junction of the Sag Channel with the main Sanitary Canal.

the Sanitary District. The Sanitary District was responsible for regulating and measuring diversions from Lake Michigan which entered the Illinois Waterway system at Blue Island and subsequently the O'Brien Lock, at the controlling works at Wilmette and at a lock and controlling works completed in 1938 by the Sanitary District near the mouth of the Chicago River. The old Blue Island Lock, with its restrictive 50-foot width, was removed in 1967.

Part I of the Calumet Sag modification included widening the north and east banks of a bend in the Little Calumet River, which was completed in 1960 after 2 years of construction, and widening turning basin No. 5 at the entrance to Lake Calumet which was completed in 1962.

The cost of the Calumet Sag navigation project through fiscal



year 1976 was about \$106 million of which \$93 million represents the share of the Federal Government as compared with \$12.5 million contributed by non-Federal interests.

Other segments of the project authorized by the river and harbor act of 24 July 1946 including replacement of the emergency dam in the Chicago Sanitary and Ship Canal above Lockport, construction along the route of the Grand Calumet River and the Indiana Harbor Canal of a 225-foot wide channel and construction of a lock and control works in the Grand Calumet River west of the Indiana Harbor Canal (part II) were placed in the inactive category in June 1973. Widening the 10.4-mile reach of the Chicago Sanitary and Ship Canal from Lockport to Sag Junction from 160 to 225 feet (part III) was placed in the "deferred for restudy" category in March 1972.

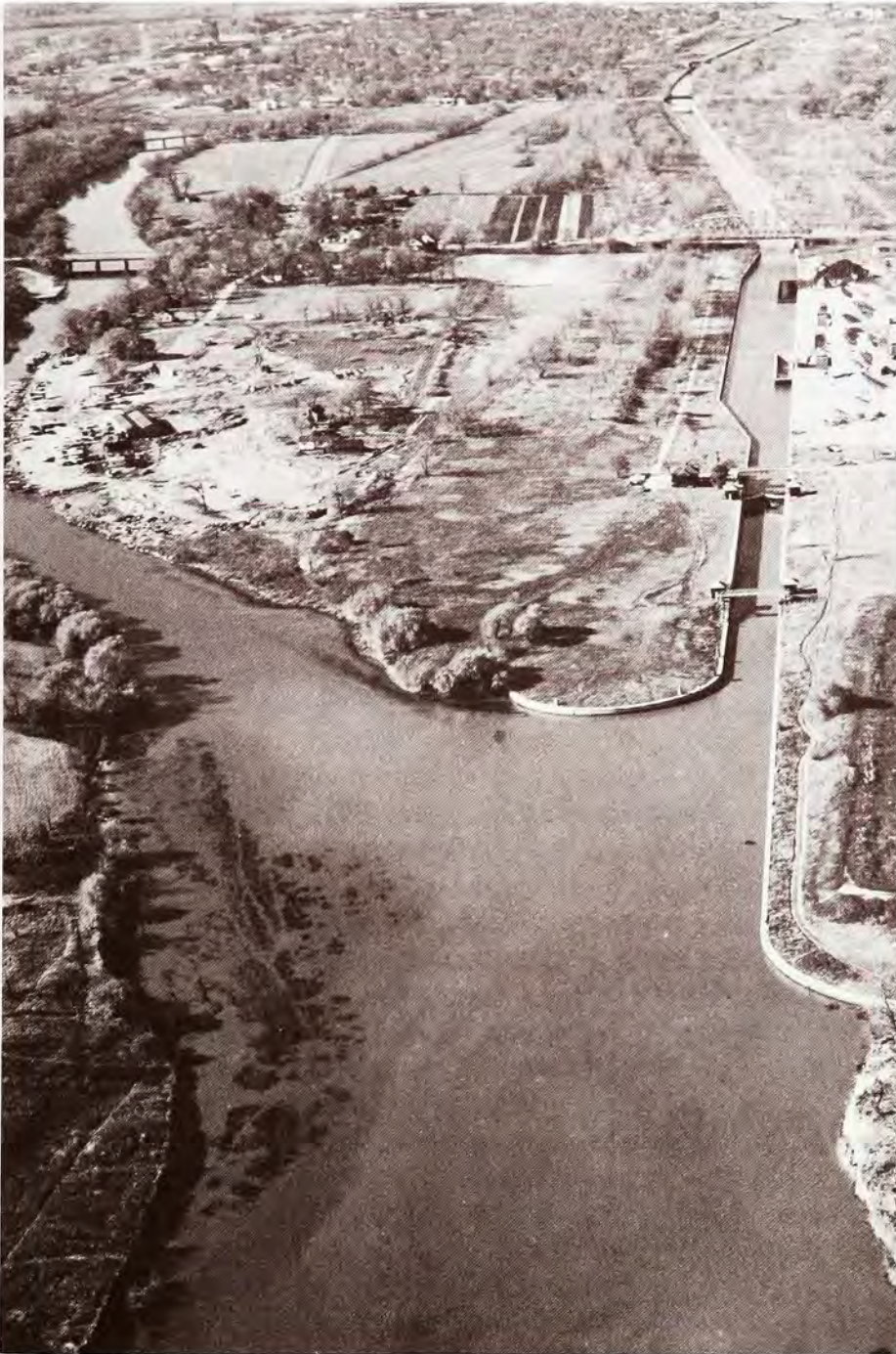
Two new bridges constructed as part of the Calumet Sag Channel improvement can be seen in the middle background of this 1962 photo.





The Thomas J. O'Brien lock located in the Calumet River at 134th Street replaced the Chicago Sanitary District's Blue Island Lock. It is located nearer the lake than the older structure and provides better assurance that polluted flood waters do not reach the lake.

Even without the additional improvements authorized by the 1946 act but never constructed, traffic on the Illinois Waterway increased to a record 45.3 million tons in 1974. The success of the Illinois Waterway and the increasing number and size of the tows used there had, as early as 1962, induced Congress to authorize duplicate or supplemental locks 1,200 feet long and 110 feet wide at Lockport, Brandon Road, Dresden Island, Marseilles, Starved Rock, Peoria and LaGrange. By the early 1970's it was time to review the duplicate locks project in the light of new conditions and the desire of local interests. The results of this review are part of the history of the decade of concern and reevaluation discussed in chapter five.



This 1960 photo shows the junction of the Calumet Sag Channel with the Little Calumet River and the Chicago Sanitary District's Blue Island Lock before it was removed in 1967. The Chicago Sanitary District, which regulates and monitors diversion of water from Lake Michigan into the Illinois Waterway, did so at the Blue Island Lock and subsequently at the O'Brien Lock as well as at controlling works at Wilmette and at a lock and controlling works completed in 1938 near the mouth of the Chicago River.



Chapter 2

Commercial ports, small-boat harbors and other navigation projects

The 50 active years of Great Lakes harbor history following the Civil War culminated just prior to World War I in the development of deep-draft harbors to accommodate lake freighters 600 feet long, 60 feet wide with a 32-foot molded depth drawing 19 feet of water. Although larger vessels were built, lake freighters of the 600-60-32 class with a capacity of 11,000 to 12,500 gross tons remained standard until after World War II.¹

The simple harbor with two piers extending into the lake to provide access to the natural haven offered by the lower reaches of a river for the smaller sail and steam vessels of an earlier era, though not discarded everywhere, was outmoded. At the busiest commercial harbors not only greater depth but also more room was provided by widening and creating turning basins in the rivers and by building breakwaters behind which newer and larger freight vessels could safely discharge their bulk cargoes and find refuge from storms.

This half century of growth and change was followed by nearly 20 years when very few new harbor projects were authorized. This was a period during which previously authorized projects were completed, structures built earlier were repaired and reconstructed in part with more permanent materials, and dredging was carried out to secure and retain the authorized project depths.

In this respect Calumet Harbor was typical for the period. There



the project with modifications was completed by 1922. Other Corps of Engineers work at the harbor included maintenance activities such as breakwater and pier repairs, 1917-1918; almost annual dredging from 1922 to 1932; replacement of timber with concrete superstructure, 1920-1925; and some riprapping, 1933.²

In respect to its waterborne commerce, Calumet was not typical. There the spectacular growth which began in the 1890's continued into the early decades of the new century. Between 1910 and 1928 the quantities of iron ore, coal and lumber received, and the amount of wheat, corn and manufactured iron shipped, doubled the annual tonnage at the harbor from 7½ to over 15 million tons.³

The only harbors for which new projects were authorized between 1916 and 1930 were Milwaukee, where a south breakwater was authorized in 1922; Green Bay, where the authorized depths were increased in the inner channel and turning basins by legislation in 1925; Menominee and Waukegan, where legislation authorized depths ranging from 18 to 20 feet in 1930, and Michigan City, where an increase of depth on the lower reaches of Trail Creek was authorized in 1927.

Today waterborne traffic at Oconto Harbor on the west shore of Green Bay is primarily in cargoes of locally caught fish. This 1971 photo shows what had taken place since the original project for two parallel piers was authorized in 1882. The north pier was completely removed by local interests and a rubble-mound breakwater constructed in 1967 about 250 feet north of the original structure. The south pier which was badly deteriorated in 1971 has since been rehabilitated.



During the first 100 days of President Franklin D. Roosevelt's administration the 73d Congress, in an effort to overcome the financial emergency, passed the National Industrial Recovery Act which, among other things, established the Public Works Administration (PWA). The PWA, which provided employment through public works construction, spent more than \$4 billion on 34,000 works. In addition to the Illinois Waterway such navigation projects as Green Bay, Port Washington, Calumet and Kenosha Harbors benefited from PWA or other emergency programs.

At Green Bay Harbor a project to deepen the outer channel to 22 feet and to widen and deepen the channel of the Fox River where it passed through the city was included in the PWA program on 3 June 1934. This work was completed by the Corps of Engineers using Public Works Funds in 1937. On 31 August 1933 a Public Works Administration press release announced that public works funds would be made available for a project modification at Port Washington Harbor which included a new north breakwater, removal of part of the old north pier, dredging the outer basin and entrance channel to 21 feet, and dredging the two inner basins to 18 feet. This project was completed by the Milwaukee District in 1934. On 6 September 1933 the Corps of Engineers began the construction of a detached breakwater and dredging in the outer harbor to 26 feet at Calumet. In addition, the channel in the Calumet River was to be straightened and widened and the five turning basins were to be deepened to the 21 feet available in the adjacent river channel. This work was also accomplished with Public Works funds. On 28 May 1935 deepening to a 21-foot depth at Kenosha Harbor was included in the emergency relief program known as the Works Progress Administration (WPA) signed into law by President Roosevelt on 8 April 1935. The project was completed by the Milwaukee District using emergency relief funds in 1936.

All four of these projects were given congressional authorization by the River and Harbor Act signed by President Roosevelt on 30 August 1935, after construction on them had started with funds provided by the President's Emergency Relief Program. This act was particularly significant for it affected 13 of the 20 navigation projects in the Chicago District. Excluding two provisions for the Illinois Waterway and the four projects already mentioned, the 1935 act provided for existing project dimensions at Sheboygan Harbor and the Sturgeon Bay and Lake Michigan Ship Canal; a breakwater extension as well as new project depths at Indiana Harbor; a north breakwater and removal of the old north pier as well as greater project depth at

Facing page:
The "W. E. Fitzgerald," a 420-foot, single screw, self-loading freighter in the South Branch of the Chicago River in the summer of 1936. The Chicago River provided less room to maneuver and berth for such lake freighters than nearby Calumet River. As a result shipping declined here while it grew at Calumet Harbor.

Kewaunee Harbor; new project depths and removal of the old north pier at Manitowoc Harbor; restoration of the old breakwater and enlarging the entrance to the small-boat harbor at Michigan City Harbor; enlarging the area dredged to 21 feet at Milwaukee Harbor; and deepening the harbor entrance and inner basin at Two Rivers Harbor.

Undoubtedly, an administration and Congress well disposed toward supporting public works as a means of creating employment and stimulating the economy helps to explain this outburst of authorizations after some 20 years of comparatively few new works. Corps of Engineers procedures for establishing projects which had been worked out over a hundred years of civil works activities, and the laws which Congress had provided over this period to insure the soundness of Corps projects, helped to assure that the navigation works authorized in 1935 were economically justified and, insofar as possible, met the desires of local interests.

How these procedures worked can be illustrated with the Kenosha Harbor project. In January 1934 the House Committee on Rivers and Harbors requested the Board of Engineers for Rivers and Harbors to review existing reports on Kenosha Harbor and otherwise determine if further improvements were necessary there. The matter was referred to the Milwaukee District Engineer, Wisconsin born, University of Wisconsin Graduate, Lieutenant Colonel Harry M. Trippe, who made a preliminary examination as required by law and followed this with a survey to determine economic feasibility. On 22 May he held a public hearing in Kenosha which was attended by Congressmen, the State senator and assemblymen representing the community as well as the city manager, other city officials and industrial representatives. The city of Kenosha, the Kenosha Harbor Commission, the Kenosha City Planning Commission, the Kenosha Chamber of Commerce and the Manufacturers Association of Kenosha presented a joint petition expressing their desires for harbor improvement.

At Kenosha local interests desired that the harbor project depth be increased to 21 feet, that the project width be maintained at 200 feet and where possible at 250 feet, and that an extension be made to the existing detached breakwater to connect it with the shore so as to provide protection to boats entering the harbor and to prevent filling in of the channel.

The District Engineer found that a depth of 21 feet was necessary so that larger vessels using the harbor could carry full loads and was justified by savings in transportation costs which would result. He concluded, however, that the cost of extending the breakwater would be



A car ferry entering Kewaunee Harbor in 1952. Since that date portions of the south pier have been rehabilitated. Waterborne commerce has averaged over 1¼ million tons annually during the last ten years and consists primarily of incoming petroleum products and car ferry traffic which operates throughout the year between here and Frankfort and Ludington Harbors, Michigan.

disproportionate to the benefits received. The Board of Engineers for Rivers and Harbors agreed with the District Engineer as did Major General Edward M. Markham, then Chief of Engineers, who made the recommendations known to the Chairman of the House Committee on Rivers and Harbors on 1 February 1945. The project was subsequently authorized as recommended and was completed in 1936.⁴

As at Kenosha, many of the improvements desired by local interests involved deepening of harbors to facilitate the handling of larger vessels. This was the case at Sheboygan where there had been instances of vessels striking the bottom and even sinking. Local interests, who in this instance were joined by the Lake Carriers'



Recreational craft shown here locking through the Menasha Lock in Wisconsin are typical for the Fox River today. No commercial traffic has been reported there since 1966. As authorized by the River and Harbor Act of 1958, the Federal Government has turned over the upper Fox River above the mouth of the Wolf River, 10 miles above Oshkosh, to the State of Wisconsin.

Association, did not agree as to the extent of deepening required. Their recommendations ranged between 28 and 30 feet at the harbor entrance from 22 to 23 feet in the inner harbor. The District Engineer's recommendation of a 25-foot depth at the lake end of the entrance channel and a 21-foot depth in the inner harbor was authorized by the 1935 Rivers and Harbors Act. These dimensions continue to apply to the Sheboygan project.⁵

Local interests did not always desire to deepen their harbor nor were their desires always compatible with the interests of large vessel navigation. At Port Washington local interests wanted to narrow the harbor entrance by constructing an extension to a breakwater on the south side of the harbor. Their primary purpose was to make the inner harbor basins safe for the moorage of small craft during severe storms. The District Engineer, Lieutenant Colonel Trippe, designed a

breakwater and other improvements which made the harbor safer but which would not "... destroy or seriously curtail the usefulness of the harbor for the important large vessel traffic in coal which this port is primarily intended to serve." The 1935 Rivers and Harbors Act authorized his recommendations and the project was completed in 1936.⁶

The Port Washington Harbor project of 1935 showed an appreciation by the Corps of Engineers of the needs of small craft while at the time assuring use of the harbor by large lake vessels. The project authorized in 1935 for Michigan City Harbor is an example of an undertaking primarily for the benefit of recreational craft. The needs of recreational boaters were not always a responsibility of the Corps of Engineers but in an act of 10 February 1932 Congress expanded the definition of waterborne commerce to "include the use of waterways by seasonal passenger craft, yachts, houseboats, fishing boats, motorboats and other similar watercraft, whether or not operated for hire."⁷

The Michigan City Project of 1935 demonstrates the implications of this act. By 1935 the only waterborne commerce that seemed to be permanent at Michigan City was some 300 tons of fish annually. However, the number of locally owned motorboats had increased considerably and an increase in yachting activities resulted in a desire for a safe harbor of refuge and anchorage ground for pleasure boats. Local interests had petitioned for repair of the old east breakwater which had been abandoned for maintenance by the River and Harbor Act of 21 January 1927, construction of a steel sheet-pile wall around the outer basin, dredging of the basin to 12 feet, and widening of an entrance gap in the east entrance pier.

In view of the policy regarding pleasure craft adopted by Congress in 1932 the Chicago District Engineer, Lieutenant Colonel Daniel I. Sultan, believed the United States was justified in assuming a portion of the cost of providing all these improvements except the sheet-pile enclosure. Further improvements, he said, should be left until such time as increased use of the harbor might demonstrate a need for them. The project was authorized as recommended and was completed in 1936.⁸

In addition to the projects provided for in the 1935 River and Harbor Act, two new projects were authorized and several projects were modified in the years prior to World War II. Of special interest was the decision to dredge the channel of the Manitowoc River. The project there, as authorized in 1907 and modified in 1910, provided for two breakwaters to form an outer harbor and a channel 21 feet

deep extending from that depth in the lake to the mouth of the river a total of about 2,500 feet. Over the years the city had spent an average of \$8,000 a year dredging and maintaining the river channel.

The city, at a public hearing held at Manitowoc on 22 July 1935, said it could not continue to pay the cost of maintaining the river because of large unemployment relief costs and, since the river channel was used mostly for interstate commerce, the expense should be borne by the general public. The Lake Carriers' Association joined the city fathers in criticizing a policy of the Corps of Engineers expressed by the Board of Engineers for Rivers and Harbors on 30 July 1913 to the effect that the Government should confine its work at Great Lakes ports to the construction of breakwaters and entrance piers and to dredging in the outer harbors.⁹ Lieutenant Colonel Trippe, Milwaukee District Engineer, recommended Congress provide for dredging a channel 21 feet deep and 150 to 180 feet wide on the lower reaches of the river.¹⁰

This modification to the project at Manitowoc was provided for on 26 August 1937, when President Roosevelt signed the River and Harbor Act of that year. Dredging the river channel was completed in 1942. The 1937 act also authorized improvement of Big Suamico River, a small stream which flows into Green Bay, and Pensaukee Harbor on the west shore of Green Bay. Modifications were also made by the act to the projects at Green Bay Harbor, Calumet River, Indiana Harbor, and Racine Harbor.

There were no project modifications or new navigation projects during World War II, but the House Committee on Rivers and Harbors requested several reports concerning the advisability of harbor improvements. One such request had to do with enlarging the outer harbor basin at Racine. Commerce there had been gradually increasing since 1932 until in 1941 it had reached nearly 373,000 tons, all except about 3,000 tons of which was coal brought there by steamers and motor vessels with lengths up to 600 feet.

The River and Harbor Act of 26 August 1937 had provided for removing of shoals lakeward and ½ mile east of the harbor entrance as well as widening the channel through the outer basin and dredging the river channel, but funds had not been appropriated to complete this work because local interests had not met the conditions of local cooperation which included providing a public dock and warehouse. At a public hearing held at Racine on 10 May 1942, local interests requested that the authorized work be carried out independent of their meeting these conditions.



The principal reason given for enlarging the basin was the great difficulty in winding around the shoal there. Forty-one of the 147 steamers using the harbor had drafts of 18 to 20 feet. Larger vessels had to back up and go ahead to turn in the basin, and it was necessary at times for these vessels to be deliberately rubbed along the bank to prevent ramming and probably damaging the breakwater. There was no tug service at Racine. The nearest tugs were at Milwaukee 26 miles away, an impractical distance for tugs to travel particularly in bad weather when they would most likely be needed. The improvement, local interests pointed out, would be of great value in maintaining an adequate coal supply for the many Racine industries engaged in producing materials urgently needed for the war effort.

A lake freighter docked in turning basin number one, the first of three provided by the Federal Government along the Calumet River copious enough to allow turning of the largest lake vessels. Annual traffic at Calumet Harbor and River averaged nearly 29 million tons annually during the 1965-1974 period.

The Milwaukee District Engineer, Major George Kumpe, recommended widening the outer basin an additional 175 feet to a depth of 21 feet, somewhat less than what was desired by local interests but sufficient to make the harbor equal to most harbors on the lake with similar bulk vessel traffic. The Board of Engineers and Chief of Engineers, Major General Eugene Reybold, concurred with this recommendation but the Secretary of War and the Bureau of the Budget believed that the value of the improvement to the war program was not sufficient to justify its being carried out during the emergency.¹¹

The River and Harbor Act of 2 March 1945 established the present dimensions of the Racine project including an entrance channel 23 feet deep, a channel 21 feet deep to the river's mouth and a dredged channel 19 feet deep on the lower reaches of the Root River. Modifications for a number of additional projects which had been postponed because of the war were also authorized by the 1945 act. These included an extension upstream of the channel on the Menominee River, a turning basin on the Sturgeon Bay and Lake Michigan Ship Canal, additional dredging in the Waukegan Harbor, and dredging of the river channel in the Milwaukee, Menominee and Kinnickinnic Rivers as part of the Milwaukee inner harbor project. As at Manitowoc, the city of Milwaukee supported by the Lake Carriers' Association had maintained as early as 1939 that the Federal Government should take over improvement and maintenance dredging of the river channels. The city, they said, had already spent considerable money improving the channels, commerce on the rivers was 99 percent interstate or foreign and, since the Federal Government had assumed maintenance of river channels at other Great Lakes ports, the same consideration should be extended to Milwaukee.

All of the modifications provided for in the River and Harbor Act of 1945 were attuned to Great Lakes navigation as it had existed for nearly 40 years and aimed primarily at accommodating lake freighters with 600-foot length, 60-foot breadth and 19-foot draft. Two post-World War II developments stimulated ambition of many lake communities for larger and more capacious harbors. Immediately after World War II a dozen or so bulk cargo vessels were built which were larger than anything that had ever sailed the lakes. One of these freighters, the Wilfred Sykes, launched at Lorain, Ohio, on 28 June 1949, was 678 feet long and 70 feet across. When launched, the Sykes was the largest ship on the lakes and the first lake ship built to burn oil. At full draft the Sykes could haul 21,700 tons, nearly twice the 11,000 tons of

the average freighter. After 1949 nearly every shipping line on the Great Lakes launched a vessel which could be favorably compared with the Sykes. Before long there were giant carriers of over 700 feet in length (Bowen). Whenever navigation conditions permitted, motivation to build larger vessels was strong since doubling cargo capacity had been known to multiply net earnings fourfold.¹²

The other postwar development which affected harbor planning was progress toward congressional authorization of United States participation in the construction of the Saint Lawrence Seaway. The idea of opening the Great Lakes to ocean navigation was an old one and on 3 October 1945 President Harry S. Truman urged Congress to enact legislation "... so that work may start on this great undertaking at the earliest possible time." He reminded Congress that, "During the war we were forced to suspend many of the projects to harness the waters of our great rivers for the promotion of commerce and industry and for the production of cheap electric power ... For over 50 years the United States and Canada under both Republican and Democratic administrations, under Liberal and Conservative governments, have envisioned the development of the project together as a joint enterprise."¹³

By 1945 the Canadians had already constructed half of their share of the undertaking. The United States had still to make a major contribution. In 1940, President Roosevelt had authorized the Corps of Engineers to make a survey of the St. Lawrence River and in the following year, 1941, a mutual agreement was signed at Ottawa between the United States and Canada for navigation improvements on the St. Lawrence River and on the Great Lakes to provide deepwater navigation from Montreal to the head of the lakes. The United States Congress took no action on the agreement and Canada decided to go ahead on its own.

As early as 1940 the Corps of Engineers Great Lakes Division submitted estimates to the Board of Engineers concerning possible costs of providing 27-foot entrance channels and turning basins at certain Great Lakes harbors—among them Michigan City, Chicago, and Milwaukee. After the war the Great Lakes Division, which prior to 1954 performed many of the services provided today by the North Central Division, continued to provide Congress with estimates of costs pertaining to the seaway, for deepening of Great Lakes connecting channels as well as for deepening entrance channels and turning basins at certain Great Lakes harbors. Depths of 27, 30 and 35 feet were considered. Estimated costs increased enormously as the depths considered increased. In 1948, for example, deepening

10 representative lake harbors to 27 feet was estimated to cost around \$9 million, deepening to 30 feet nearly \$41 million and to 35 feet \$82½ million.

On 23 January 1949 the *Chicago Sunday Tribune* broke the relative quiet concerning these early planning exercises and announced that according to army engineers, "Chicagoland harbors can be deepened readily to accommodate the ocean vessels that will call here when the Saint Lawrence Seaway is completed." The *Sunday Tribune* announced that, "Initially the Seaway will provide a minimum channel depth of 27 feet over the 2,347 miles from Montreal, present terminus for ocean navigation, to the head of Lake Superior."

One result of the *Sunday Tribune* article and similar publicity was to stimulate to action harbor communities which thought they might be excluded from the Seaway development project. City officials at Manitowoc and Green Bay, for example, wrote the Milwaukee District Engineer, then Colonel John O. Colonna, on 11 and 23 March 1949 concerning the role of their harbors in the contemplated development. Colonel Colonna's replies to the two communities were essentially the same. "These preliminary estimates. . . ." he wrote the Green Bay Association of Commerce, "do not preclude improvements of Green Bay Harbor or any other harbor of the District. In the event that the St. Lawrence Project is adopted, local interests at each harbor could request their congressional representatives to authorize the Chief of Engineers to conduct a survey with a view toward improvement of their harbor to handle St. Lawrence traffic. Such a study would have to show that the improvement would be economically justified just as in all harbor improvement matters."¹⁴

It was some years, however, before the United States' role in the seaway could emerge beyond the preliminary planning stage. Finally on 13 May 1954 President Dwight D. Eisenhower signed the St. Lawrence Seaway Act which provided for \$105 million in revenue bonds to furnish funds for the United States' share of seaway construction. Deepening of the connecting channels between Lakes Superior, Huron, Michigan and Erie began in May 1957; and by June 1962, a 27-foot depth was available in all of these channels. That depth had been available on the St. Lawrence Seaway and the Welland Canal since 1962.

Studies preliminary to deepening harbors on the Great Lakes to provide harbor depths commensurate with those on the Great Lakes connecting channels and St. Lawrence Seaway were initiated by resolutions of the Committees on Public Works of the Senate and the House of Representatives on 18 May and 22 June 1956, respectively.

The Board of Engineers was to determine the advisability of further improvement of the harbors "in the interest of present and prospective deep draft commerce, with due regard to the scheduled time of completion of the St. Lawrence Seaway and the connecting channels between the Great Lakes." At that time there were 61 commercial harbors on the Great Lakes with controlling depths from 16 to 26 feet, with only three harbors having depths of 26 feet. Of the harbors in the Chicago District, Calumet and Indiana Harbors had depths up to 26 feet in their protected areas. Most harbors had depths ranging from 20 to 22 feet but Two Rivers, Waukegan and Michigan City Harbors had depths of only 18 feet.

Between 1959 and 1965 interim reports were submitted to Congress recommending improvements at 30 Great Lakes harbors and recommending one new harbor. The recommendations, which included seven harbors in the Chicago District: Green Bay, Manitowoc, Milwaukee, Kenosha, Chicago, Calumet and Indiana as well as construction of a new harbor at Burns Waterway, Indiana, were made after a careful study.

Twenty-six public hearings were held between 16 October 1956 and 28 February 1957 in connection with the Great Lakes Harbor study. A hearing was called at Milwaukee, for example, on 29 November 1956, by the Chicago District Engineer. Milwaukee and other harbors on the western shore of Lake Michigan had become part of the Chicago District when the Milwaukee District was disbanded on 1 May 1955. The usual local interests were represented. The city of Milwaukee and the Milwaukee Chamber of Commerce wanted an increase in the project depth to 27 feet in the main entrance channels of the outer harbors, throughout the anchorage areas of the outer harbor, through the harbor entrance and main channels of the Kinnickinnic River, and otherwise, an increase of project depth to 22 feet throughout the principal channels of the inner harbor. Local interests requested these improvements because 46 lake vessels already had drafts of 24 feet or more, and their number was increasing rapidly, and because the then most recent additions to the Great Lakes fleet had loaded drafts of over 25 feet while vessels were already being planned with drafts of at least 26½ feet. Within a few years, local interests believed, most of the bulk commodities moved over the Great Lakes would be carried in the larger, deeper vessels because of the savings as compared to movement of cargo in smaller vessels.

Colonel Joseph A. Smedile, District Engineer of the Chicago District, recommended dredging the approach channel to a 30-foot

depth through the breakwater entrance and increasing the depth to 28 feet in the entrance channel, to 28 feet in the south outer harbor, and to 27 feet in the inner harbor including reaches of the Milwaukee and Kinnickinnic Rivers up to the first bridges. This work was authorized by the River and Harbor Act of 1962 and was completed in July 1967.

The Milwaukee project plans were fully coordinated with State and Federal agencies before implementation. Governor Gaylord Nelson of Wisconsin, in a letter to the Chief of Engineers dated 6 January 1961, spoke of the necessity for the improvements and the fact that they had "been reviewed by the interested State agencies including the Conservation Department, which is responsible for the administration of State laws affecting fish and wildlife. . . . All interested parties look with favor upon the proposed project."¹⁵

The U.S. Fish and Wildlife Service, Department of the Interior, in a letter of 14 October 1960 from its North Central Regional Office made specific reference to the plans to dispose dredged materials from Milwaukee Harbor in an established deepwater dump ground 5 miles southeast of the harbor entrance. Mr. W. A. Elkins, Acting Regional Director, commented, "Bureau personnel have discussed repetitive use of these deepwater dumping grounds with personnel of the Wisconsin Conservation Department and Bureau of Commercial Fisheries. All agencies are mutually agreed that continued use of these areas will in no way be harmful to the sport or commercial fisheries of Lake Michigan."¹⁶

According to a long accepted practice, the plan for deepening the harbor at Milwaukee included dumping dredged materials in authorized dumping grounds in the lake. It was a policy which was looked on favorably by local interests since it relieved them of a requirement to provide lands or easements for onshore disposal.

Harbor improvements in connection with the Great Lakes-Saint Lawrence Seaway were authorized by the River and Harbor Acts of 1960, 1962, and 1965. The 1960 project at Calumet included deepening the outer harbor and the channel between the harbor piers as far as the first bridge to 28 feet. The 1962 act authorized deepening in the Calumet River to 27 feet from below the first bridge to turning basin number 5. Some hard material was still to be removed in the outer harbor, and isolated sections of the Calumet River still needed to be widened and straightened but dredging on these projects was essentially complete in 1968.

Deepening of the outer harbor to 28 feet and the channel to 27 feet as far as the first bridge was authorized for Indiana Harbor in 1960. This work was completed in 1963. In addition to the Chicago and



Milwaukee Harbors, deepening at Green Bay, Manitowoc, and Kenosha Harbors was authorized in 1962. At Green Bay Harbor a channel dredged to 24 feet on the stretch of the Fox River running through the city was started in 1966 and completed in 1973. Manitowoc Harbor was to be deepened to 23 feet but this work has never been undertaken and is currently inactive. The channels there are dredged to 21 feet. Kenosha Harbor was authorized a depth of 25 feet. This work was completed in May 1965.

The New Burns Waterway Harbor was authorized in October 1965. On 3 November Brigadier General Roy T. Dodge, Division Engineer at Chicago, wrote to Chief of Engineers, Lieutenant General William F. Cassidy calling his attention to an "... unusual provision of the 1965 act ... The authorization of reimbursement for State work on Burns Harbor. All indications here," he added, "are that the State of

Breakwaters completed in 1910 at Manitowoc Harbor are seen at the upper left of this 1950 aerial view. Since 1937 the Federal Government has also been responsible for maintaining navigable depths on the lower 1.7 mile reach of the Manitowoc River. Waterborne commerce averaged close to 2 million tons annually for the 1965-1975 period.

Indiana is proceeding with plans for building the harbor beginning next spring, with a view toward getting reimbursement."

As anticipated, the State of Indiana began construction of the harbor in 1966 in conformity with designs approved by the Corps of Engineers. A north breakwater and outer west bulkhead were completed in 1968. Dredging was completed in August 1970. In 1969 the Chicago District began working with the Indiana Port Commission on procedures for reimbursing the State for the Federal features of the project. By 30 June 1976 total Federal costs for the project were \$14,650,000 including annual average maintenance costs of \$226,000 for the years 1972 through 1975.

Since 1965 there have been only two modifications in the authorized projects for Lake Michigan harbors under the jurisdiction of the Chicago District—one at Manitowoc Harbor involving dredging in the river channel to a 12-foot depth and one at Menominee Harbor involving deepening of the river channel to a 19-foot depth. A recreational harbor was authorized at Northport in Door County, Wisconsin, in 1972.

On the whole, there have been few structural modifications and few new harbors in the Chicago District since World War I. By 1976 all major harbor projects were completed except for the incomplete portions of the 1960 and 1962 modifications at Calumet Harbor, already referred to, and some dredging on the Chicago River between North Avenue and Addison Street which had been authorized in 1946.

At some harbors navigation has increased in recent years over earlier averages. This is true at Calumet Harbor where the 1965-1974 annual average was 28,900,000 tons. At Green Bay the annual average for the 1965-1974 period was 2,716,000 tons, more than a million tons over the 1925-1934 average. At Port Washington there has also been a significant increase in waterborne traffic over the 1920-1930 period.

There has been some drop in traffic at Chicago, Indiana Harbor, Kenosha, Milwaukee and Sheboygan, and a more considerable loss of tonnage when compared with the annual averages of the 1920's and 1930's at Two Rivers, Racine, and Menominee Harbors and on the Sturgeon Bay and Lake Michigan Ship Canal.

Most Lake Michigan harbors have experienced a marked increase in recreational traffic; local public and private interests have constructed mooring, launching, and other marine facilities at many Lake Michigan harbors to support recreational boat activities but there is a critical need for additional facilities. Local interests have assured their

willingness to provide cooperation in construction by the Federal Government of recreational harbors at Kenosha, Racine, Sheboygan, Manitowoc, Algoma and at several locations in Milwaukee County. In April 1977 Colonel Andrew C. Remson, Jr., District Engineer of the Chicago District, recommended that detailed investigations be undertaken of possible recreational boat harbor sites at these locations.

In recent years dredging to maintain harbor depths, which includes disposal of dredged materials, has presented special problems. With the great industrialization of the land adjacent to the lake, and the increases of population, greater concern began to be experienced in the 1960's over the possible harmful effects of disposing materials dredged from navigation channels into designated and approved areas in the open lake. In 1966 a pilot study was authorized by the Corps of Engineers in compliance with President Lyndon B. Johnson's Executive Order 11288 to determine the feasibility of alternate dredging disposal practices. This study and the results of subsequent legislation authorizing the Corps to construct, operate and maintain facilities to confine polluted dredged materials are discussed in Chapter 5.



Chapter 3

Flood control and local flood protection

The greatest known flood on the Illinois River was in 1844. The river was still in a state of nature. The few inhabitants there had constructed no obstacles to hinder its flow. Above LaSalle where the bottomlands are high and the bluffs never more than 2 miles apart, flooding was limited. But farther downstream at Beardstown, some 85 miles above the river's mouth, the bluffs are 6 to 7 miles apart and the Illinois River bottoms from there to the Mississippi River are low. The river had ample room to spread out. The bottomlands acted as reservoirs and the swollen current, where it moved through the timberlands back from the mainstream, was sluggish. It took many weeks before this water returned to the riverbed. The flood was long and leisurely.

The 1844 flood sufficiently awed inhabitants of the valley that they made, and their children preserved, rough marks at points between the mouth of the river and Starved Rock to show how high the water had reached. These marks 60 years later made it possible to calculate that the 1844 flood was indeed the greatest flood of record on the Illinois River.

As the valley became more settled, the rich bottomland soil attracted farmers who discovered that at first they could raise 80 to 90 bushels of corn per acre there. Even as the richness of the soil decreased, a yield of 50 to 60 bushels of corn was common. It was unfortunate that on the average these lands flooded 1 year out of 3.

The floods of May and June 1892, caused by heavy rains, led to construction of the first levee worthy of the name on the Illinois River by the Lacey Drainage and Levee District. Previous to that date some



levees of sufficient height but of small cross section had been constructed by land agents more interested in selling land than in preventing floods. This levee, constructed across from Havana, 120 miles upstream from Grafton, was 4.3 miles long. It protected a cultivated area of nearly 3,000 acres, but few homes and not over a dozen permanent residents.

The Lacey levee was followed by another in 1899 constructed opposite Beardstown by the Coal Creek Drainage and Levee District. It was 10.1 miles long and protected some 6,000 cultivated acres and 17 dwellings inhabited by about 40 permanent residents. Two additional levees were completed in 1902, the Robley levee opposite Kampsville, about 32 miles upstream from Grafton, and the LaMarsh levee opposite Pekin, about 132 miles above Grafton.

In January, February and March 1904 a record of 9.3 inches of rain fell in the Illinois River valley. This, plus the melting of accumulated ice and snow, caused the river to reach heights of as much as 24 feet

Floods were frequent along the Illinois and Des Plaines River in the early years of this century. This photo shows York Avenue in Joliet during the flood of 1902 when three persons were killed and damages reached \$750,000. Water as deep as six feet covered Joliet's south side and flood victims were forced to evacuate their homes by boat.

above flood stage. It was the flood of greatest volume since 1844. Only the Coal Creek District levee withstood the flood. In the flooded areas, crops still on hand from the previous fall together with winter wheat in the field were destroyed and buildings and machinery were damaged.

By coincidence the War Department was conducting a survey of the Illinois River in the 1902-1904 period and accumulated much valuable data on the 1904 flood which, when combined with all available additional data on the river and published in 1905, provided useful information for those desiring to build new levees and drainage ditches. Many new drainage districts were formed and many new levees were constructed in the years immediately following. One new levee was completed in 1905, six in 1908, one in 1909, three in 1910, one in 1911, three in 1912, and two in 1913. By the latter date construction of levees had reduced the width of the floodplain in the valley below LaGrange by approximately 80 percent.¹

Like the flood of 1904, the 1913 flood was caused by heavy spring rains accompanied by melting snow. Of the 23 drainage districts the levees of 5 were topped and the districts flooded. A comparison with the flood of 1904 clearly showed the results of the levee construction between 1904 and 1913, especially on the river stretch between Beardstown and Valley City where with a volume of water about equal to the 1904 flood the river rose from 2.6 to 3.3 feet higher in 1914.

Levee construction by the drainage and levee districts continued and extended upstream as far as Peoria until by 1922, another year of flood, there were 54 known levees enclosing more than 186,560 acres of bottomland.

A long-continued period of rainfall began over the Illinois River valley in the final months of 1921. The spring thaw began early in 1922 when in the final days of February temperatures reached near record highs. The tributaries, particularly the Sangamon and Kankakee Rivers, had begun to rise when March rains, 2 to 5 inches above normal, added more moisture to the already saturated valley.

Because the width of the floodplain had been reduced by levees, the flood reached heights even greater than expected from the volume of water. Beardstown and Naples were entirely surrounded. Rail lines were shut off and emergency supplies had to be brought in by boat. Hundreds of homes in Beardstown had to be abandoned. All streets were under water and all places of business except the post office had water over their main floor.

Levees broke almost daily throughout April. If they had not, the river would have risen even higher. Of the 54 levees 28 failed and 88,400 acres of cultivated land which these levees had enclosed were flooded, destroying large amounts of grain, livestock, agricultural machinery and other property and preventing the raising of any crops that season. The loss of personal property and crops in the levee districts exceeded \$1.7 million. Damage to towns was estimated at \$1.3 million; railroads, highways and property outside the levee districts suffered an estimated \$1.2 million in damages. Conservative estimates placed losses due to the flood at \$5,660,000, while one firm estimated total flood losses in the valley to have exceeded \$20 million.

After 1922 landowners became more skeptical about the value of bottomlands for farming and some became more appreciative of their value as undrained lands for hunting and fishing preserves. By the late 1920's a large amount of unleveed land was owned or leased by hunting and fishing clubs made up of businessmen from Chicago and St. Louis. In any event, after 1922 all attempts to finance new levees ended in failure.

The levee districts had not entirely recovered from the losses of the 1922 flood when they were hit in 1926 and 1927 with a double flood. The Illinois River was above flood stage from September 1926 to July 1927. From 29 August to 5 October 1926, 16 inches of rain fell over the Illinois River watershed, nearly 4 times the normal precipitation. On 12 October the river broke all records by rising to 26.36 feet at Beardstown and reached highest stages of record on the 68-mile stretch between Havana and Valley City. Of the 55 levees then on the Illinois River, 27 failed and some 104,000 acres was flooded. Most of the damage was below Peoria. Losses to individual planters were \$3,720,000 including damage to crops, livestock, machinery and buildings. Total losses on the Illinois River, exclusive of tributaries, are believed to have been over \$8 million.

Most of the levees topped in the 1926 flood had not been repaired, and still others, softened by the many months of high water, gave way for the first time when hit by the flood of 1927. Heavy rainfall in February, March and April over a watershed already saturated and with streams bank-full caused this flood. Although it is difficult to separate the 1927 losses from those of 1926, they are thought to have been around \$4.2 million.

Following the floods of 1926 and 1927 most of the levee districts were unable to raise funds either from the landowners, who had lost

their crops two years in succession, or by borrowing from the banks. Early in 1927 the Governor of Illinois, Len Small, requested the State legislature to make an appropriation of \$1.5 million to assist levee districts to repair broken levees not only on the Illinois River but on the Mississippi and Ohio Rivers as well. The legislature complied and the funds were available on 1 July 1927. By the end of the year 52 contracts had been let and repairs were under way.

The State legislature also made a separate appropriation of \$350,000 for construction of a concrete seawall along 2,500 feet of riverfront at Beardstown in an area where there was insufficient room for a levee, and for levee construction upstream and downstream of the wall. This work was completed on 30 June 1928.

Until 1928 the Federal Government was not involved in flood control on the Illinois River. However, a River and Harbor Act of 4 March 1923 during President Warren G. Harding's administration had prepared the way for eventual Federal cooperation in control of floods on at least the lower reaches of the Illinois River. The act was principally concerned with flood control on the Mississippi River but funds appropriated under its authority might under certain circumstances be used on the tributaries as well.

The 1927-1928 floods on the Illinois River corresponded in time with the completion, on 1 December 1927, of a comprehensive Army Engineer plan for carrying out the 1923 Flood Control Act. This plan, adopted in the flood control act signed by President Calvin Coolidge on 15 May 1928, included provisions in section 6 for Federal participation in flood control activities on the tributaries of the Mississippi River insofar as these streams were affected by backwater from the Mississippi River.

Determining the precise point on the Illinois River at which backwater from the Mississippi River no longer had an effect was a highly technical problem for which somewhat different answers might be honestly arrived at depending on the data used. The answer was an academic one until 1928 when levee districts up and down the Illinois River began to apply to the Mississippi River Commission for assistance under provisions on the 1928 law. The Mississippi River Commission then tentatively determined that the limit of Mississippi River backwater effect on the Illinois River was at mile 89, just about at the upper limits of the city of Beardstown.

The Flood Control Act of 1928 authorized an expenditure of \$325 million over a 10-year period for flood control on the Mississippi River and, provided local interests paid one third of the costs, the Federal Government could assist in levee construction on the Illinois River

upstream to the point where Mississippi River backwaters ceased to have an effect. This point was eventually moved as far upstream as Havana at mile 120 and between there and Grafton the Mississippi River Commission and local interests enlarged the levees of 12 levee districts completely and 4 others partially. Eight large projects ranging in cost to the Federal Government from \$114,000 to \$237,000 were below Beardstown. In all, \$1,317,216 was spent by the Federal Government for assistance in levee construction on the Illinois River under the act of 15 May 1928.

The 1928 act also provided \$2 million for comprehensive surveys of streams throughout the United States in the interest of flood control, navigation, power development and irrigation. Responsibility for completing a survey of the Illinois and Des Plaines Rivers fell to Minnesota born, and University of Minnesota graduate, Lieutenant Colonel William C. Weeks, District Engineer of the First Chicago District.

Colonel Weeks' report, submitted on 6 December 1929, included a comprehensive history of floods and flood control on the Illinois River and a detailed analysis of steps which should be taken to control future floods. In discussing the history of levee construction on the Illinois River he speaks critically of the radical reduction of the floodplain for opening the bottomlands to agriculture. "In some localities," he comments of the situation after 1913, "the landowners became even more grasping or indifferent than before. . . ." But his doubts concerning the wisdom of constricting the floodplain with levees were realistically balanced with the recommendation that when new levees were built they should be placed back from the river and that all levees should be constructed better, with tops 8 feet wide and with gradual slopes, rising 1 vertical foot to 3 horizontal feet on both sides. He also recommended levees in preference to flood control reservoirs on the Illinois River because he believed them adequate, if built properly, and less expensive.²

Colonel Weeks did not favor an extension of Federal participation in flood control activities upstream of Beardstown. The Board of Engineers for Rivers and Harbors generally agreed with his findings and also concluded that "No Federal participation in flood control is warranted beyond that authorized by existing law." So did the Chief of Engineers, Major General Lytle Brown, who recommended to the Secretary of War on 15 December 1931, "That assistance to local interest in flood control (on the Illinois River) be as now authorized by law."³

Between 1928 and 1936 Federal participation in flood control efforts on the Illinois River stopped, if not at Beardstown, at least at

Havana. In the latter year, on 22 June, President Franklin D. Roosevelt signed the Flood Control Act which established the nationwide policy that flood control on navigable waters or their tributaries is in the interest of the general welfare and is the proper activity of the Federal Government when carried out in cooperation with the States and local entities. There was now no practical limit to where the Federal Government might assist in flood control efforts provided local interests were sufficiently interested in the improvement to pay for the costs of lands, easements, and rights-of-way necessary for the construction of the project, agree not to hold the United States responsible for damages which might arise, and maintain and operate the completed works.

The Flood Control Act of 1928 authorized flood control improvements on the lower reaches of the Illinois River; that of 1936 dealt primarily with the stretch above mile 79 and extending about 128 miles farther upstream to include the Hennepin Drainage and Levee District. Some 20 projects were involved, all to be carried out according to the general plan prepared by Colonel Weeks and presented in his report of 6 December 1929.

Two types of projects, one which aimed at facilitating the flow of water through the floodplain and one which provided improved flood protection, were involved. Neither type sought to significantly extend the system of levees already constructed by private interests.

At South Beardstown Drainage and Levee District on the left (east) bank of the river between miles 79 and 88, both types of improvement were carried out. The 1936 Flood Control Act as supplemented by an act of 1938 authorized removal of 1.2 miles of riverfront levee and construction of 3.3 miles of levee set farther back. This was done to improve the flood channel which was only about 1,000 feet wide at this point. In addition, to improve flood protection, sections of levee were made higher and wider and given more gradual slopes. The project which protects about 10,300 acres of farmland was completed in 1941 at a cost of \$442,000, about one-fifth of which was provided by local interests.

A similar project was undertaken at the Coal Creek Drainage and Levee District on the right (west) bank of the river between miles 85 and 89. Here Colonel Weeks had proposed that local interests place a setback levee 3,000 feet long at the north end of the district. The project as authorized for Federal participation by the Flood Control Acts of 1936 and 1938 also included lowering of the riverfront levee and reconstruction of other levees to make them more secure. This project, completed in 1954, provides protection to about 6,800

acres of farmland and cost nearly \$2 million, of which \$83,000 was provided by local interests.

Setback levees to improve the floodplain were also constructed at the Lacey-Langellier-West Mantanzas and Kerton Valley Drainage and Levee District on the right bank of the river between mile 111 and 119. An area of 7,800 acres of farmland is protected by this project, completed in 1942 at a cost of \$1,326,000, of which \$36,000 was contributed by local interests.

A setback levee recommended by Colonel Weeks for the Thompson Lake Drainage and Levee District on the right bank of the river between miles 120 and 126 was authorized in 1936 but never built. Instead, owners of the district, with assistance from the Civilian Conservation Corps, raised and widened the existing levees to the standards used on Corps of Engineers projects.

That Corps of Engineers involvement in levee construction on the Illinois River did not necessarily involve an expansion of the levee system can be variously illustrated. A setback levee to be constructed by private interests had been recommended by Colonel Weeks for the Chautauqua Levee and Drainage District on the left bank of the river just above Havana. The project was authorized for Federal participation by the Flood Control Act of 1936. Instead the area was converted to a waterfowl refuge which was allowed to flood at high water stages while at medium and low stages a pool for waterfowl was maintained.

The Big Prairie Drainage and Refuge District on the right bank of the river between miles 80 and 84 had been organized in 1916 and contained about 1,800 acres. Colonel Weeks had proposed in 1929 that the levee district move its levee back from the river to improve the floodplain. After 1932 the drainage district became inactive, cultivated only the higher lands, and allowed its levees to deteriorate. In November 1938 the Chicago District Engineer, Captain Samuel N. Karrick, recommended that the district be purchased by the United States and converted to a floodway and storage reservoir for the benefit of navigation, flood control and wildlife. The flood control act of 22 December 1944 authorized the improvement which would involve purchasing the district and lowering 5,500 feet of levee but, as it has not been possible to justify the project economically, it has since been recommended for deauthorization.

Most of the flood control projects built in consequence of the 1936 and 1938 Flood Control Acts were completed before World War II. The project at East Peoria between river miles 160 and 162 was not completed until 1945. Instead of agricultural lands this project

provides protection for a highly developed industrial area. The project, which cost \$297,000, was designed to withstand a flood that could result in damages as high as \$54 million. East Peoria is protected from floods by still another Corps of Engineers project. The Flood Control Act of 22 December 1944 authorized the construction of two earth dams to form reservoirs on Fondulac and Farm Creeks and channel improvements on Farm Creek and its tributaries. The project was completed in 1954.

The Flood Control Act of 1936 also authorized 17 flood control improvements on the Sangamon River. This tributary of the Illinois River has its source in east central Illinois and flows west for 250 miles before entering the main river about 9 miles above Beardstown. The floodplain in the Sangamon River valley varies in width from 3 miles at the river's mouth to about $\frac{1}{2}$ mile 190 miles upstream. In its original state the 125,000 acres of extremely fertile bottomland along the lower 190 miles of the Sangamon River and along the lower course of its tributary, Salt Creek, was subject to frequent flooding. In the 28-year period, 1919 to 1937, lower Salt Creek and the lower Sangamon River left their banks and caused damage 16 times.⁴

By the time of Federal involvement in 1936 local interests had, at their own expense, constructed about 100 miles of levees and had straightened considerable portions of the Sangamon River and Salt Creek, both of which were originally very crooked. In general, the levees provided only partial protection from floods. Channel straightening reduced the frequency of overflow.

Eleven of the 17 improvements authorized for Federal participation in 1936 were for raising and otherwise upgrading existing levees. The remainder provided for further improvement of the channels, the alteration of a railroad bridge to improve the floodplain and the construction of one new levee. Twelve of these projects have never been constructed and most have been recommended for deauthorization by the District Engineer because they lack economic justification or because there is no local interest in completing them.

Improvement of existing levees at the Mason and Menard and at the Oakford Special Drainage Districts was expedited by the Chief of Engineers in October 1937 when he allotted regular and relief administration funds to get them started. The Mason and Menard project, which protects about 5,870 acres of farmland, was completed in 1939 at a cost of \$98,000, \$4,000 of which was contributed by local interests. The Oakford project was also completed in 1939. It protects 2,600 acres of farmland and was constructed at a cost of \$41,000, including \$2,000 for non-Federal expenses. A project to alter the

Chicago and Illinois Midland Railroad bridge at Oakford was completed in 1940. No contributions from local interests were required for this \$98,000 project.

Three additional projects are of special interest, two because of shortcomings which, when they became apparent, led to project modifications, and one because it was deauthorized to make room for a more ambitious project.

The 1936 project at Farmers Drainage and Levee District on the north bank of the Sangamon River below Oakford involved reconstruction of the riverfront levee and construction of an additional riverfront levee and a flanking levee. The project which cost \$160,000 was completed in 1941. In 1943 a flood greater than any previously experienced in the area inundated the levee district despite the improvements. The Flood Control Act of 1962 modified the project to provide for raising low sections of levee and extending levee protection downstream for an additional 2.4 miles. Funds have not been appropriated to construct the modification. If constructed, the modified project would provide improved protection for 7,950 acres of farmland.

The Flood Control Act of 1936 also authorized the excavation of a new channel, 200 feet wide, extending from the mouth of the Sangamon River to a point 6.7 miles upstream and included provisions for a diversion channel and other works to maintain a high water table in an adjacent wild game preserve. The project was completed in 1949 at a cost of \$764,000. Despite the remedial efforts the nearby wildlife refuge and hunting and fishing areas, including about 1,400 acres of waterfowl habitat, were deprived of water. A project modification in 1960 provided for supplying water to these areas. The plan, as finally designed, included a system of six shallow wells capable of providing water as needed and maintaining pond levels in the game and fish conservation areas even during drought years. Completion of this \$284,000 project awaits funding. When completed the well system will be operated and maintained by the Illinois Department of Conservation which acted as the local sponsor for the project.

One of the projects authorized for the Sangamon River and Salt Creek in 1936 provided for clearing the channels of these streams at 50 bridges. The Flood Control Act of 1962 deauthorized the Sangamon River portion of the project because of a multipurpose dam and reservoir proposed for location on the Sangamon River 1½ miles above Decatur, Illinois, which was authorized by the same act. This project, eventually called the William L. Springer Lake, was caught up in the issues which characterized the decade of concern and reevaluation, 1966-1976, and will be discussed in chapter 5.

Of that generation of flood control projects between World War II and those which bear the mark of the increased environmental considerations of the late 1960's, the Sid Simpson Project at Beardstown remains to be mentioned. Here the seawall or floodwall completed with State funds in 1928 was damaged by the flood of May 1943, a record flood on this reach of the Illinois River. Congress, in the Flood Control Act of 1950, authorized construction of a new section of floodwall to replace the damaged portion, as well as strengthening and extending the remaining portion and adjacent levees. The project was completed in 1967 at a cost of \$5,789,800.

The projects completed in the first three decades of flood control activity by the Chicago District, 1936-1966, were mostly projects with a single purpose and for the most part they involved upgrading of efforts begun earlier by drainage and levee districts along the Illinois River and its tributary, the Sangamon River and Salt Creek.

In 1941 the section of the Illinois River from Havana to Grafton was transferred to the jurisdiction of the St. Louis District, Corps of Engineers.

Several flood control studies and projects affecting the Little Calumet River and the North Branch of the Chicago River, because of the nature of the concerns of which they are an expression or because of ways in which they deal with the flood control problem, belong to a new generation of projects and are discussed in detail in chapter 5.

Chapter 4



Work for others: World War II and after

On 16 May 1940 President Franklin D. Roosevelt in asking for additional appropriations for national defense remarked, "We stand ready not only to spend millions for national defense but to give our service and even our lives for the maintenance of our American liberties." Six days earlier, on 10 May, Germany had invaded the Low Countries; a month before that, on 9 April, Germany had invaded Norway and Denmark. Soon Germany would invade France. On 21 May Roosevelt vetoed an authorization bill for rivers and harbors. "It seems to me," he said in his veto message, "that the nonmilitary activities of the war department should give way at this time to the need for military preparedness."¹

The 1940 rivers and harbors appropriation finally approved on 24 June 1940 included no new projects. With the shift of priorities it was not clear what was to become of the Corps field organization including 11 divisions and 46 districts which had been working on civil projects improving channels and building levees, breakwaters, locks and dams. Surplus Corps of Engineers officers could easily be reassigned but the backbone of the Engineer Department was its civilian organization, and this would be dispersed unless it could play a role in the emergency.

Construction for the army was being carried out by the Quartermaster Corps which lacked the field organization of the Engineer Department and was having difficulty with the vast construction load which was part of the defense buildup. In November 1940 construction for the Army Air Corps was turned over to the Corps of Engineers.

This program provided a practical test to show what the Engineer Corps could do with an unfamiliar assignment.²

By 1 December 1941 new facilities were being occupied by Air Force personnel at 96 stations, fields, depots, schools and replacement centers. In addition, a score of new installations, including three big aircraft assembly plants, was almost ready for use. In January 1941 the Air Force construction program had amounted to \$200 million and was 32.5 percent complete. In November the program stood at \$708 million and was 66.5 percent complete.³

Much of the credit for this accomplishment goes to the field organization of the Corps of Engineers. In the spring of 1939 Major General Julian L. Schley, Chief of Engineers, had said that if responsibility for Air Force construction was given to the Corps, "The existing organization of the Engineer Department would be used without material change. The detailed engineering design and all construction would be handled through Division and District Engineers. . . . To get results required, these organizations must be allowed to handle, with as few restrictions as possible, all engineering design, preparation of construction drawings and specifications, procurement, contracting, accounting and disbursement." When General Schley took over the Air Force program in 1940, he gave the field the same freedom in awarding advertised contracts and approving plans and specifications that they had long enjoyed for civil works projects.³

Among those impressed with the Corps accomplishment of the Air Force program was Undersecretary of War Robert P. Patterson, who in a memorandum to President Roosevelt on 28 August 1941 said, "The Engineers, as you know, do a great deal of civilian construction in normal times, rivers and harbors, flood control, etc., and are a going concern. The Quartermaster, on the other hand, has normally no adequate organization to handle construction. If we had had the Engineers on the entire construction program last year they would have moved in with an experienced organization and much waste would have been avoided."⁴

Undersecretary Patterson recommended transfer of all Army construction to the Corps of Engineers and drafted a bill that would make this possible. It took some weeks for the bill to pass both houses of Congress but on 1 December 1941 it was signed into law by President Roosevelt.

On 16 December, a week after Pearl Harbor, the transfer of the entire Army construction program from the Quartermaster Corps to the Engineer Corps took place. Before the end of the war 27,000

projects were involved costing \$15.3 billion, including camps to house 5.3 million troops; plants to produce explosives, ammunition, tanks, and planes; hospitals providing nearly half a million beds; ports and depots; bomber bases; the Pentagon building; and facilities for the Manhattan Project. It is in the context of this total achievement that the accomplishments of the Chicago District during the wartime years must be seen.

From a small, relatively static organization carrying out peacetime river and harbor and flood control duties, the Chicago District was expanded to the much larger force needed for defense-related activities. Along with the Milwaukee District, the Chicago District's wartime mission included construction of plants for production of war materials; bases and camps for air and ground forces; warehouses, dock and loading facilities; and procurement of construction equipment and supplies needed for an unprecedented total and global war.⁵

Throughout the war the Chicago District functioned as part of the Great Lakes Division which also included districts with headquarters at Buffalo, New York; Detroit, Michigan; Duluth, Minnesota; and Milwaukee, Wisconsin. The Division, which had been headquartered at Cleveland, Ohio, moved to Chicago early in 1942 to be in a more central location.

The Great Lakes region was the Nation's most important manufacturing center and within the boundaries of the Great Lakes Division lay Detroit, Chicago, Milwaukee, Buffalo, Cleveland and Peoria, which were not only the location of giant factories important for war production but also centers for the crisscrossing of the railways, highways, airways and waterways needed to transport the products of their factories.

What was true of the region as a whole was particularly true of Chicago. The Chicago District supervised several of the largest projects in the Corps wartime construction programs. These projects included construction of the assembly and airport facilities of the Douglass Aircraft Company at Park Ridge, Illinois; several immense ordnance projects including the Kankakee Ordnance Works at Joliet, Illinois, which manufactured TNT and allied explosives; the Wabash River Ordnance Works at Newport, Indiana, which also produced explosives, and the Gary Armor Plate Plant which produced armor plate for tanks.

Only slightly smaller undertakings were the construction of Kingsbury Ordnance at LaPorte, Indiana; Elwood Ordnance at Joliet, Illinois; Green River Ordnance at Dixon, Illinois; Illinois Ordnance at Carbondale,

Illinois, where such war-related products as mines, fuses, detonators, demolition blocks, grenades, and rockets were produced and shells and bombs were loaded.

The Chicago District's ground forces construction program included initiating construction of two camps which became major training stations for Army personnel, Camp McCoy at Sparta, Wisconsin, and Camp Ellis at Table Grove, Illinois. Camp McCoy was turned over to the Milwaukee District for completion but Camp Ellis, which had housing and training facilities for 35,000 soldiers, was completed by the Chicago District.

The Chicago District also supervised construction of the Vaughn General Hospital at Hines, Illinois, which was able to house and care for nearly 2,000 soldier patients, and the Mayo General Hospital at Galesburg, Illinois, which could provide for over 2,200 patients. It also supervised the conversion of the Chicago Beach Hotel into Gardiner General Hospital and, the largest hospital project of all, the conversion of the Battle Creek Sanitarium at Battle Creek, Michigan, to a general hospital.

For the Air Force the Chicago District improved and extended facilities at a number of existing airfields including George Field, Lawrenceville, Illinois, a large training center; Chanute Field, Rantoul, Illinois; and Scott Field at Belleville, Illinois. In addition, the District constructed and expanded warehouse and storage depot facilities at Lincoln Ordnance Depot, Springfield, Illinois, and at the Savanna, Illinois, Ordnance Depot Proving Ground.

The District also planned modification so as to make operable bridges in and near Chicago to permit submarines and other vessels built on the lakes to reach the Gulf of Mexico via the Illinois and Mississippi Rivers.

Long before the war, plans had been drawn up by the Chief of Engineers office in Washington for the establishment in the case of an emergency of six procurement districts to procure the construction materials and equipment which would be needed in a war emergency. These were to have been entirely separate from the civil engineering districts.⁶

When the procurement districts were activated in November 1941 there was a shortage of officer personnel with the necessary purchasing experience to take charge. Plans had to be modified. At the very time when he was taking over the vast responsibilities involved in the supervision of the military construction program, the Chicago District Engineer began to receive requisitions to purchase

supplies from the Procurement Branch of the Office of the Chief of Engineers in Washington.

At first the larger contracts were handled in Washington. By the fall of 1942 when the construction program had relaxed somewhat, a system of procurement was stabilized whereby the Chicago Procurement District, located in the heart of the construction machinery industry, contracted for all the tractors and cranes needed by the Engineer Corps.

Depending on their location other procurement districts had other specialties. For purposes of procurement, the Districts had somewhat different boundaries from those of the Engineer Districts. The Chicago Procurement District, for example, included 12 states, 7 of which—North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa and Missouri—were totally outside the area in which the Chicago District Engineer exercised his engineering responsibilities. In addition, until 1943, the Chicago District reported directly to Washington on procurement matters and the Great Lakes Division played a relatively minor role.

A few figures provide an idea of the staggering proportions of the procurement effort. Over 75,000 tractors of various classes were procured by the Chicago Procurement District during the war for every service on all the fighting fronts. Likewise, unprecedented quantities of graders, scrapers, road rollers, steel and aluminum landing mats, airport crash fire trucks, outboard motors, saws, cranes and shovels, generation units, Bailey bridges, and many other items were procured by the District for the war effort.

With the end of the war the Chicago District returned to its peacetime river and harbor and flood control duties but not entirely, for the Cold War, the Korean conflict, and the war in southeast Asia brought with them new defense requirements and the Chicago District did not become a solely civil works organization again until 1 April 1970.

Among the first peacetime missions of the District was the demobilization of the Sangamon Ordnance Plant and the conversion of one TNT line at the Kankakee Ordnance Works to produce fertilizer. Military construction by the Chicago District between 1945 and 1965 also included: NIKE-guided missile bases surrounding the Chicago-Gary, Minneapolis-St. Paul, Milwaukee and St. Louis air defense areas and construction of structures and facilities for the Missile Master, an integrated electronic system governing the tracking and fire control of installations ringing the Chicago-Gary area. These projects were

followed by improvements in these defense systems and modification of Missile Master and NIKE sites to accommodate the Hercules Missile. In addition to these things during the Korean conflict construction and rehabilitation were undertaken at the same ordnance plants that had been constructed for use during World War II. This also occurred again during the war in Vietnam.

A number of projects at Army installations were also carried out during this period. At Fort Benjamin Harrison, Indianapolis, Indiana, projects included construction of a student barracks, a consolidated mess, an expansion of the central heating plant and steam distribution system, modification of a classroom building for a defense information school, construction of an Army finance center building and subsequently alteration of the building to provide for installation of a digital computer and optical scanner. At Fort Sheridan, Illinois, District projects included alteration of old quarters to provide modernized units for military families, construction of a central heating plant and steam distribution system, electrical system improvements and construction of 250 new housing units as well as rehabilitation work in 1966 to accommodate a new Fifth Army Headquarters facility. At Savanna Army Depot, Illinois, the District constructed an additional weapons support facility and 32 units of family housing. At the Rock Island Arsenal, Illinois, District work included such varied activities as mounting new cranes capable of handling as much as 40 tons, installing a new boiler, and rehabilitation of several rail and highway bridges leading into the arsenal.

For the Air Force, the District constructed three airmen's dormitories, altered an auto maintenance shop, modified a large hangar into a training center and carried out much other work at Chanute Air Force Base, Rantoul, Illinois. Beginning in 1961 the District also carried on a construction program at Scott Air Force Base, where among other things two airmen's dormitories and two bachelor officers' quarters were constructed. At the Air Force portion of the O'Hare International Airport, Chicago, three barracks were rehabilitated for use and the old Douglass Aircraft Assembly plant that was there was demolished.

For the Air Force section of Phelps-Collins Airport, near Alpena, Michigan, the Chicago District supervised a \$1.3 million program which included construction of an aircraft shelter, ammunition storage facilities, maintenance buildings and barriers to stop high-speed landing aircraft. At Selfridge Air Force Base, Mount Clemens, Michigan, a supply warehouse and office addition were constructed under a half-million dollar contract. At Volk Field, Camp Douglass,

Wisconsin, an airmen's dormitory and dining hall facilities were modified. Twenty-six ammunition storage facilities as well as an auto maintenance shop were constructed. At Finland Air Force Station, Minnesota, an operations building was altered.

The Chicago District responsibilities for military construction covered a larger area than the Civil Works District. In 1961 the District acquired military construction responsibilities in the State of Minnesota from the St. Paul District. At the close of 1965 the Chicago District took over military construction responsibilities for the State of Michigan from the Detroit District. The Chicago District continued doing work at Army and Air Force installations until 1970 when with one exception its military design and construction functions were transferred to the Omaha District.

The exception was the construction of five TNT production lines involving a new process at Newport Army Ammunition Plant, Indiana, an undertaking involving an expenditure, it was estimated in 1964, of \$75 million. At the time that the rest of the District's military construction responsibilities were transferred to Omaha, this project was about 60 percent complete. All construction contracts administered by the Chicago District in connection with the Newport project were complete by the end of 1973.

Although by this date the Chicago District no longer was constructing for the Army or Air Force, it was still involved in doing work for others. In 1971 (?) the District was assigned responsibilities for constructing a bulk mail facility at Forest Park, Illinois, for the U.S. Postal Service. Construction of a number of smaller post offices (referred to as preferential facilities) was also assigned to the Chicago District. This assignment also included postal facilities at Rockford, Illinois; Bloomington, Illinois; South Bend, Indiana; Gary, Indiana; and Oshkosh, Wisconsin.

On 30 June 1973 engineering and design by the Chicago District of facilities for the U.S. Postal Service was terminated except for the projects in progress. The smaller preferential facilities were all completed by the end of 1974. But completion of the bulk mail facility, a much more complex project including construction of a building the size of 11 football fields to house 14,000 feet of track for computer-operated carts; 47,000 linear feet of conveyors and chutes; 120 miles of under floor electrical conduit; 3,220 miles of electrical wiring; 6,000 computer connections; 1½ miles of lookout galleries; 7,400 sprinkler heads; etc., all used to sort mail packages, took more time.⁷ On 9 April 1975 Chicago District Engineer Colonel James M. Miller reported to Division

Engineer Brigadier General Walter O. Bachus, "We reached a significant milestone at the Chicago Bulk Mail Center when USPS (United States Parcel Service) started the processing of live mail on 7 April 1975."

Soon thereafter, for the first time since the outbreak of World War II, the Chicago District was again solely a civil works organization carrying out the river and harbor and flood control responsibilities placed upon it by Congress. There was no chance, however, of the District settling back to perform more or less routine functions. The 1960's saw the introduction of a new era in all matters having to do with the natural environment. Even the most routine operations of the past were being subjected to new scrutiny. It was a time for exploring new ways to do the old jobs and for discovering ways to solve problems which had never been tackled before.

Chapter 5



A period of concern and reevaluation: 1966–1980

A growing concern for the natural environment and an increasingly evident desire of more and more people to participate in decisions concerning that environment affected all the civil works activities of the Chicago District during the period 1966–1980. Some projects exhibit the influence of these trends more dramatically than others and are treated in this chapter.

For decades material dredged from lake harbors had been deposited in designated areas of Lake Michigan, a routine activity which had gone on unchallenged. There was one common underwater dumpground, for example, for the Chicago, Calumet and Indiana Harbors which had been used for disposal of dredged material since 1924. It was a rectangular area about 5 miles wide and 17 miles long. The average depth was 69 feet. The capacity of this disposal tract was such that it could be used for many years to come. The southwest corner of this 90 square mile area was 9 miles due east of the entrance gap in the breakwater at Calumet Harbor.

Dredging in the early 1960's was performed at these harbors by contracting. The dredged material from Chicago, Calumet and Indiana Harbors, and the Chicago and Calumet Rivers was excavated by dipper dredges with a capacity of 4 to 12 cubic yards. The dredged material was placed in dump scows with capacities of 600 to 1,500 cubic yards. The loaded scows were then towed to the dump area where the doors on the bottoms of the scows were released, and the spoil would settle to the lake bottom. The cost of dredging and disposal by this method ranged from \$1.65 a cubic yard at



A dredge scoops up a load of lake bottom during operations in the summer of 1966 to deepen the lake approach channel and berthing area so as to accommodate deep draft vessels at Navy Pier in Chicago's outer harbor. At this time the dredged material was deposited in an open lake area designated for this purpose.

Indiana Harbor to \$2.75 per cubic yard at Chicago Harbor. Comparable dredging and disposal methods were used at other Lake Michigan harbors.¹

In the mid-1960's, to the surprise of those who did not have a feeling for the changing public mood, disposal of dredge spoil in the lake became an important environmental issue which evoked criticism of the Corps of Engineers' operations. Since this was a problem which affected all the lakes it was natural that the North Central Division Engineer should be one of the first to become aware of the changing public attitude and in the forefront of the search for alternative solutions.

On 12 July 1965 North Central Division Engineer Brigadier General Roy T. Dodge reported to Lieutenant General William F. Cassidy, then Chief of Engineers, that it was apparent "... that public attitudes toward pollution are becoming more critical and we must reevaluate our procedures and policies on industrial waste, spoil disposal and domestic waste from government activities." He also predicted that "Should we be required to discontinue our long-standing practice of

disposing of dredged material in dumping grounds in the lakes, our costs would be materially increased."²

The Chief of Engineers replied on 5 August agreeing, "You are quite correct in concluding that the public is becoming increasingly insistent that pollution of the Nation's waters be stopped" and asking the Division Engineer for his suggestions as to how the Corps' support of pollution control might be strengthened. The Division Engineer responded by initiating studies to determine the feasibility of alternate disposal practices for the Chicago, Calumet, Indiana Harbor complex, for Milwaukee Harbor, and for the most critical harbors on Lake Erie, Lake Ontario, Lake Huron and Lake Superior. Temporary measures to accommodate dredged spoil for an interim period until long-range disposal areas could be provided were also considered.³

The Chicago District was assigned responsibility for determining the feasibility of providing alternative disposal areas for Chicago Harbor and River, Calumet Harbor and River and Indiana Harbor. The alternatives would assure that contaminated materials dredged from these harbors and rivers would not be deposited in the open lake. The Chicago District Engineer, then Colonel Edward E. Bennett, submitted his report in September 1966. For disposal of dredged material from Chicago Harbor and Chicago River totaling an estimated 150,000 cubic yards in the 10-year period 1967-1976, he considered using a group of abandoned stone quarries near Lemont, Illinois. The estimated 2 million cubic yards of material to be dredged from the Calumet Harbor and River during the 1967-1976 period could be placed in a diked area along the Calumet River.

Two plans were studied for Indiana Harbor. One involved cooperation with the Chicago Park District which was planning the construction of an artificial peninsula with an area of about 20 acres to extend into the lake 1,000 feet and to be used for lake front park purposes. About 900,000 cubic yards of dredged material could be placed here behind steel sheet piling bulkheads. The remainder of the 1,900,000 cubic yards anticipated to be dredged from Indiana Harbor during the 1967-1976 period could be placed in the same abandoned stone quarries near Lemont, Illinois that were being considered for disposal of material dredged from the Chicago River and Harbor. Use of the alternative sites would push the cost per cubic yard of dredging to roughly three times the old cost.

Colonel Bennett did not hesitate to recommend "... that the Corps of Engineers be authorized to proceed immediately with detailed design studies with a view to early preparation of alternative sites..." Other District Engineers made similar recommendations. To



In October of 1967 material dredged from the Indiana Harbor Canal was placed in land fill areas protected by bulkheads as part of the Corps of Engineers program to develop alternatives to dumping polluted dredged material into Lake Michigan.

provide contained enclosures with a capacity to hold the spoil of 10 years dredging at 15 of the most polluted harbors on the Great Lakes would cost an estimated \$95 million and an additional \$3 million would be needed annually to use the new dredging methods.⁴

By the end of September 1966 reports on these studies were being reviewed by the Office of the Chief of Engineers before being submitted to the Bureau of the Budget. "We are faced with a difficult problem," General Cassidy wrote General Dodge on 30 September, "and should pursue every possible action to meet the demand for corrective measures where necessary."

The Bureau of the Budget recommended that before such an expensive program be initiated, the Corps, in cooperation with the Federal Water Pollution Control Administration (FWPCA) and other agencies, conduct an investigation of the whole dredging disposal program on the lakes. The study which was called the Pilot Program for Determining Alternate Methods of Disposal of Polluted Dredgings



or simply the "Pilot Program" was placed under the direction of the Buffalo District Engineer. The Chicago District and other districts in the Division assisted in the study.

During the two years in which the study was being carried out the Chicago District had to resolve the problem of what to do in the meantime at harbors critically important to lake navigation, particularly Indiana, Calumet, Milwaukee and Green Bay Harbors as well as the Chicago and Calumet Rivers. In 1967 dredging at Lake Michigan harbors was kept to a minimum. At Green Bay diked disposal areas were used; at Milwaukee dredging was limited to a small amount of cleanup work; at Chicago Harbor and the North Branch of the Chicago River no dredging was carried out. At Calumet Harbor and River land disposal of maintenance dredging spoil was possible while material from Indiana Harbor was also deposited in enclosed land fill areas.⁵

Relatively little dredging was carried out by the Chicago District

In 1967, during the pilot program to determine alternate methods of disposal of polluted dredgings, this diked disposal area at Green Bay Harbor was used. The city of Green Bay and the mouth of the Fox River can be seen in the background. Grassy Island is immediately to the rear of the disposal area.

at Lake Michigan ports in 1968. An experiment was tried at Chicago in cooperation with the Metropolitan Sanitary District of Greater Chicago. Material dredged from the Chicago River by means of a government-owned hydraulic dredge was placed in a nearby interceptor sewer which carried it to a treatment plant. As part of the Pilot Program maintenance dredging was also performed in 1968 in the Calumet River with a government-owned dredge. The dredged material was pumped from the dredge to a land disposal area located a short distance from the river. The land disposal area belonged to the Chicago Metropolitan Sanitary District. (Historical Supplement, 1968, Chicago District.)

In the course of 1968 the Chicago District Engineer visited local authorities at each city where the FWPCA had said the harbor contained sediment to advise them of the problem and solicit their help in obtaining areas for diked disposal.

On 25 February 1969 General Tarbox, Division Engineer, reported to the Four-State Enforcement Conference on Lake Michigan Pollution on the findings of the Pilot Program. The findings included the conclusion that each harbor was unique in the kind of pollutants found, the source of pollutants, the practicality of controlling such sources and the availability of alternate disposal sites. Although it had not been possible to measure the effects of the polluted dredgings on the quality of the lake water it must be presumed, he reported, that the effect was undesirable.⁷

The benefits derived from not depositing the dredged material were real but they were not susceptible to objective evaluation. Although averaging 3½ times the cost of open lake disposal, disposal in diked areas would be the least costly effective method of withholding pollutants associated with dredging from the lakes. In 1968 it was estimated that it would cost about \$66½ million initially and \$8½ million additional annually to place dredging from the 35 polluted harbors on the Great Lakes in diked disposal areas. Only Congress could decide whether the additional costs of alternate disposal would be borne by local interests or by the Federal Government.⁸

The draft report of the Pilot Program was distributed to State and Federal agencies in March. The Chicago District conducted a comprehensive series of public hearings and briefings with the Governors or their representatives. Reactions were mixed but State and local authorities seemed to agree at least that the Federal Government should fund the increased cost of disposal in diked areas.⁹

The Chicago District performed dredging operations at Kewaunee,

Menominee, Michigan City, Milwaukee, Two Rivers and Waukegan Harbors during the spring and summer of 1969. Little progress was made toward diked disposal.

In March 1970 Lieutenant General Frederick J. Clarke, Chief of Engineers, informed Brigadier General William W. Watkins, North Central Division Engineer, that the Bureau of the Budget had placed restrictions on expenditure of any additional operations and maintenance funds for dike construction to confine polluted material.

Then, on 15 April 1970, President Richard M. Nixon announced proposed legislation which would authorize the Corps of Engineers to construct contained spoil disposal facilities.¹⁰

In anticipation of legislative action and funding, districts of the North Central Division met with representatives of the Federal Water Quality Agency and with State officials and local interests to lay the groundwork for operations under the proposed law. General Watkins, Division Engineer, reported that State and local interests were unhappy about cost sharing provisions of the proposed legislation. Otherwise, Corps and local officials agreed that while waiting for the anticipated legislation no polluted dredged materials would be dumped in the lake by the Corps of Engineers.

On 18 June 1970 General Clarke commended General Watkins "... for the close personal and effective attention you have given the Great Lakes dredging program. We should proceed," he added, "with only the minimum dredging necessary for the safety and economic welfare of the port cities, and use every informal arrangement for contained spoil areas that we can develop until the necessary authorizing legislation and funds are available to initiate the longer term disposal areas."¹¹

In 1970 the only dredging performed at harbors on Lake Michigan was at Michigan City, Indiana, where clean sand was dredged from the outer harbor and placed in an established deep water disposal area in Lake Michigan; in the Calumet River where polluted material was dredged with a Government-owned hopper dredge and was pumped from the dredge to a land area on shore a short distance from the river; and at Green Bay Harbor where unpolluted material from the outer channel was disposed of in the open lake whereas polluted material from the inner harbor was pumped 2 miles to an on-land disposal area.¹²

Legislation authorizing the Secretary of War acting through the Chief of Engineers, to construct, operate and maintain contained spoil disposal facilities, Public Law 91-611, section 123, was signed by President Nixon on 31 December 1970. The contained disposal areas

were to be constructed to contain 10 years of dredge spoil and were to be established as soon as possible at those areas where, in the judgment of the Environmental Protection Agency (EPA), they were most urgently needed. Under the law the land required for the disposal sites was to be provided by the State or a subdivision of the State, a sponsor, which would also agree to contribute 25 percent of the construction costs. The latter requirement could be waived, however, by the Secretary of the Army provided the administrator of the EPA should certify that the area involved, and the industrial concerns located there, were participating in an approved plan for the treatment of wastewater. In this way the law provided a means by which pollution of the harbors, and material dredged from them, might be eliminated.

Because of the requirement for local contribution of 25 percent of the construction costs unless the administrator of EPA determined eligibility for a waiver, local interests were slow to agree to the selection of sites for diked disposal areas. Regional EPA offices were obliged to submit their recommendations to EPA headquarters in Washington for decisions. In a letter to the Chief of Engineers, 8 June 1971, Brigadier General Ernest Graves, Division Engineer of the North Central Division, expressed concern because no progress could be made with the program while waiting for responses from EPA headquarters in Washington.

The Chief of Engineers, then Lieutenant General Frederick J. Clarke, replied on 24 June that he was aware of the problems associated with obtaining assurances from local interests relative to financing their portion of the cost for disposal areas but that it was "... essential that work on this program proceed as rapidly as possible."¹³

No determinations were made by EPA headquarters concerning eligibility for waiver of 25 percent construction costs in the summer or fall of 1971. But in October the EPA administrator delegated authority to make these determinations to his regional offices. Meanwhile, as soon as local interests gave informal agreement to a site, the Chicago District, with the understanding that all local cooperation requirements would need to be formally agreed upon before any construction contract could be left, moved ahead with design of diked disposal facilities.¹⁴

By February 1972 a site agreeable to all concerned had been selected at Milwaukee and an Environmental Impact Statement required by Section 102 of the National Environmental Policy Act of 1969 was being prepared. In August 1972 a regional wastewater

management plan, approved by EPA, was still being held up by several local entities which had yet not ratified the plan. By May 1973 these matters were clarified, the local assurances signed by the city were approved and the construction of the facility was advertised for bids. A contract was signed in June. Construction started on 13 August 1973 and the site went into operation on 10 July 1975. The facility, which was located at the southwest corner of Milwaukee Harbor, cost about \$5½ million. Dredged spoil from the harbor at Port Washington was also to be deposited at the site.

Construction of the diked disposal facility for Kenosha Harbor, also to be used for spoil dredged at Racine Harbor, proceeded as had the Milwaukee project without particular problems. It was completed and first placed in operation in November 1976.

While these projects proceeded through the steps leading to their eventual completion, the dredging backlog, due to not dredging in polluted harbors, reached 12 million cubic yards. By July 1974 Brigadier General Walter O. Bachus, North Central Division Engineer, was concerned because "... several of our channel and harbor projects risk becoming seriously shoaled if water levels drop in a short period of time." "Only high water in the lake kept the situation from being more serious."¹⁵ All nonpolluted channels and harbors were being maintained to optimum dimensions in order to assure availability of equipment to attack the backlog shoaling as diked disposal areas became available. Early in August 1974 General Bachus urged the Chicago District Engineer to have a contingency dredging plan ready which could be implemented should water levels drop suddenly.

It had been expected that disposal sites at Kewaunee, Sheboygan and Menominee Harbors would be sufficiently agreed upon to allow advertising for bids by mid-1975. However, at Kewaunee and Sheboygan local sponsors were having trouble obtaining privately-owned lands required for the projects and at Menominee Federal and State agencies claimed the site selected to be a wetland and unsuitable for use as a disposal area. On 10 October 1975 Chicago District Engineer James M. Miller wrote to Division Engineer Brigadier General Robert L. Moore, "We clearly have to reassess the entire situation at Menominee. The State of Wisconsin Department of Natural Resources is expressing opposition to continued maintenance dredging regardless of the location of the disposal area because they feel both the dredging and disposal operations are environmentally detrimental."¹⁶

As early as June 1969 General Tarbox, then Division Engineer, had written to Chief Engineer General Cassidy questioning him, "We

say we want to get the public in on the selection of alternatives. Do we really mean this? Is it possible to do so? Has anyone really done so? If so, how do we accomplish this?" General Cassidy responded to the effect that the Corps was "... indeed serious about finding improved means for public involvement in consideration of alternatives." New methods of involving the public were being tried by the Corps and the program was being monitored by the University of Michigan.

In February 1971 planning and public information personnel from the Chicago District joined others from Corps offices throughout the United States in a short course in public participation in water resources planning at the Georgia Institute of Technology, Atlanta, Georgia, during which on 2 February in a keynote speech, Lieutenant General Clarke, Chief of Engineers, told the assembled personnel: "In the past we have conducted our planning activities with a relatively small percentage of the people who have been actually concerned, and these were Federal, State and local government officials of one kind or another. Today there are, in addition, vast numbers of private citizens who, individually, or in groups and organizations and through their chosen representatives, are not only keenly interested in what we are doing with the Nation's water resources but who want to have a voice and influence in the planning and management of those resources... We cannot and must not ignore (these) other voices..."

This policy was incorporated into a Corps planning regulation (EC 1165-2-100) in May 1971 and the program was expanded and improved upon until in October 1975 a U.S. Army Engineer Institute for Water Resources Research Report was published and widely distributed which discussed in detail the design, implementation and management of a program for public involvement as integral parts of the Corps water resource planning process.

In view of the site selection problems that the District was experiencing the procedures used to select sites in the past were reviewed by the District Engineer at Chicago and in January 1976 Colonel Miller wrote General Moore that new procedures had been developed which included greater participation by concerned agencies and the public in disposal site selection at the remaining harbors.

In May 1976 Colonel Melvin H. Farrar, Acting Chicago District Engineer, could report to General Moore that "The new site selection procedures for the confined dredge disposal facilities have met with wide acceptance." Not only were working relationships with all concerned, Federal, State, and local agencies, improving but public workshops, one held on 22 March 1976 at Green Bay, for instance, were resulting in selection of sites concerning which there was gen-

eral concurrence. In addition to Green Bay progress was now being made at Kewaunee where the city had requested a change to a different site from that originally selected and at Sheboygan where the city had requested relocating a diked disposal facility to a site within the harbor and combining it with a proposed small boat harbor.¹⁷

In August 1976 the new Chicago District Engineer, Colonel Andrew C. Remson, reported full concurrence of concerned Federal, State and local officials in a site selection for confined dredge spoil disposal at Michigan City, Indiana. The public had been invited to participate in workshops and had participated in selection of the site.

Site selection was also proceeding satisfactorily at Sturgeon Bay. Only the Menominee-Marquette Harbor and the Chicago Harbor remained problems. At Menominee-Marquette arsenic contamination had been found in the bottom sediments. To find a solution a testing program was set up in cooperation with the State and the Waterways Experiment Station. At Chicago an acceptable site had not yet been found.¹⁸

There had been found, however, a unique solution to disposal of dredge material on the Calumet-Sag navigation channel project. A former gravel quarry, approximately 30 feet deep, covering about 70 acres and lying about 2,000 feet north of the canal in the town of Worth, Illinois, was to be improved with an impervious liner, and a system of underdrains both above and below the liner to prevent the pollution of the groundwater.¹⁹

During 1976 maintenance dredging was performed at 4 navigation projects on Lake Michigan. About 300,000 cubic yards of material was dredged at Milwaukee and placed in the confined disposal area there. At Kenosha about 60,000 cubic yards of material was removed and placed in the confined disposal area adjacent to the the South Pier. About the same quantity was dredged and placed in the confined disposal area at Manitowoc Harbor. For the first time since 1973 the Chicago District employed open lake disposal. About 50,000 cubic yards of material classified as being suitable for open water disposal was removed from the outer harbor at Waukegan and dropped in an established deep water area.²⁰

While it appeared during the decade 1966-1976 that eventually there would be agreement among those concerned in respect to disposal of dredge spoil, the pursuit of consensus concerning a multipurpose dam and reservoir on the Sangamon River was less successful.

The Flood Control Act of 1962 authorized construction of a 55-foot-

high and 3,500-foot-long dam on the Sangamon River 1-1/2 miles above Decatur, Illinois. The project was first referred to as Oakley Reservoir but in 1972 Congress designated the proposed improvement the William L. Springer Lake after a former Congressman who had been a proponent of the project.

William L. Springer Lake was designed as a multi-purpose project to provide flood control, water supply and opportunities for water-based recreation. The Corps of Engineers had been slow in adopting a multi-purpose approach in its water resources planning and though Corps officers did not dismiss the value of reservoirs for flood control and other water related purposes they believed, generally, as did First Chicago District Engineer William C. Weeks in 1929 that levees, if properly constructed, were more immediately effective and less expensive.²¹

The development of more complex watershed studies and projects evolved as Congress broadened the Corps responsibilities to include other facets of water use than navigation and flood control. The Federal interest in insuring a continuing supply of fresh water for urban and rural use and streamflow needs was defined by Congress over the years and is still being clarified and extended by legislation.²²

Recreation was added to Corps responsibilities when Section 4 of the Flood Control Act of 1944 authorized the Chief of Engineers "... to construct, maintain and operate public park and recreational facilities in reservoir areas ... and to permit the construction, maintenance, and operation of such facilities." The Flood Control Act of 1962 broadened the 1944 authority to include recreation in all water resources projects.²³

The estimated cost of the William L. Springer Lake Project in 1963 was \$32.4 million including about \$5 million to be reimbursed the Federal Government by local interests. Support for the project centered around Decatur, Illinois, where as late as 1968 the City Council and the Chamber of Commerce as well as the Menard County Farm Bureau actively promoted the undertaking. However, the project was increasingly opposed by conservationist groups, at least in the form of the original proposal. Controversy centered about the preservation of 1,200-acre Robert Allerton Park, an area for which the University of Illinois is Trustee.²⁴

The Trustees of the University employed a private engineering firm to study alternatives to what was still called the Oakley Reservoir. The Chicago District cooperated in this effort and also put its own

engineers to work studying alternatives which would eliminate any adverse effect on the park area. By February 1969 the Division Engineer, Brigadier General Robert M. Tarbox, could write in a letter to Brigadier General William Cassidy, Chief of Engineers, of his satisfaction with the alternatives developed by the Chicago District, "I think they have done a wonderful job using imagination and good judgment. I am excited and intrigued with the possibilities of developing something that the people will really want. . . ."

The Chicago District presented its alternative study to State and University representatives on 17 March 1969, but the State of Illinois, meanwhile, had been preparing its own alternative program. In all, by July 1969 fifteen alternative plans had been brought forward. The State's proposal, which became known as alternative fifteen, gained wide support in the summer of 1969. It provided for a second dam and impoundment in addition to the Oakley Reservoir.

Early in 1970 it seemed that the essential consensus had been achieved. At a joint press conference on 9 March 1970 held by the Chicago District Engineer and the State of Illinois Department of Public Works and Buildings complete accord was announced between the Corps and the State on a modified plan. The plan included the subimpoundment on Friends Creek, assured the preservation of Allerton Park by placing the Oakley Reservoir permanent pool some 3-½ miles below the park and provided for a greenbelt along the river below the dam with bicycle and hiking trails. The Illinois Board of Trustees also endorsed the new project plan.

Meanwhile, by 1970, the estimated cost of the project more than doubled the 1963 figure of \$32.4 million. Of the \$68 million which the project was now estimated to cost some \$14 million allocated to water supply costs was to be reimbursed by local interests to the Federal Government.²⁵

The Chicago District continued to work on the revised General Design Memorandum and final Environmental Impact Statement for the Springer Lake project until these tasks were completed in August and September 1974. It had become increasingly apparent to the District Engineer, however, that the project, primarily because of escalating land costs, was close to becoming economically unjustifiable.²⁶ By 10 July 1975 a reduction in benefits attributable to the project which had taken place in a review by the Office of the Chief of Engineers in Washington, combined with escalating costs, resulted in a benefit cost ratio of less than one. At a "summit meeting" the Chicago District Engineer, Colonel Miller, informed Senators from Illi-

nois, Charles H. Percy and Adlai E. Stevenson, III; Congressman Edward R. Madigan (21st District), Governor Daniel Walker and Decatur and Macon County officials that the project lacked economic feasibility and that the Chief of Engineers intended to recommend that it be placed on the inactive list. Work on the project ceased.²⁷

Only two weeks earlier, on 26 June 1975, Major General John W. Morris, Director of Civil Works for the Corps of Engineers had written to North Central Division Engineer Walter O. Bachus "More and more we find that the nonstructural alternatives must be the starting point in our approach to solving flood problems. Structural solutions have been fully explored and found unacceptable. Seemingly, this is the wave of the future."

Progress during the early 1970's on a plan for modernizing the Illinois Waterway by the construction of duplicate locks and other improvements provide additional evidence that the Corps of Engineers, and in particular the Chicago District, was responding to the concerns which had surfaced so forcefully in the late 1960's. Careful consideration of environmental effects of alternate plans and recognition of the public's desire for active involvement in the planning process were evident in each step the District made toward completion of a plan for the project.

In 1971 the State of Illinois temporarily interrupted progress on design of the duplicate locks by coming up with a plan of its own. The Illinois Division of Waterways developed a plan called "Through and Across Joliet" which instead of a duplicate lock at the present Lockport site, proposed eliminating the Brandon Road lock and dam, rerouting the Illinois Waterway north of Joliet and providing two new high lift locks some two miles north of the present Lockport lock. Major advantages of the plan included lowering the Illinois Waterway through Joliet where residents continued to be uneasy because the waterway there was nearly 30 feet above the southern portion of the city and the elimination of movable high level bridges which were obstacles to the flow of surface traffic.

The plan which best survived the scrutiny of all interested agencies and groups was one which most completely incorporated the State plan which, in the interim, had become known as Plan 3. The District Engineer favored this plan and in a letter to the Division Engineer dated 6 August 1974, Illinois Governor Daniel Walker indicated his qualified support of this plan. The State's primary concern appeared to be the potential loss of tax base for the city of Lockport.

In April 1975 the Chicago District completed a memorandum for the general design of phase 1 on the duplicate lock project which

recommended plan 3, essentially the State plan. Because of the immediate need for additional lockage capacity at the Lockport and Brandon Road locks, proposed improvements of the Des Plaines or upstream section of the waterway were subjected to detailed analysis. An in-depth environmental statement was prepared for the upstream project area reaching from its junction with the Chicago Sanitary and Ship Canal to the Kankakee River. Each downstream site was to be fully investigated and a detailed environmental impact statement prepared during the preparation of design memorandums for the five locks on the Illinois River.

The General Design Memorandum Phase 1 report for the duplicate lock project was submitted to the North Central Division for approval on 21 April 1975 on the supposition that the State of Illinois would shortly reaffirm its assurances for the project. On 2 May the Director of the State Division of Water Resources, Dr. Leo M. Eisel, in a letter to the Chicago District Engineer indicated that the State had identified four issues which would need to be resolved before assurances of State cooperation could be reaffirmed. Three of the State's concerns, including the project's impact on railroad transportation in the State; reimbursement to taxing bodies in the Lockport, Illinois, area for losses in tax revenue; and the effects of implementing this project on appropriations for other water resource projects in the State were, the District Engineer believed, matters of national policy which could not be resolved at the District level. The fourth issue, lack of detailed environmental studies for the lock sites on the Illinois River, would be taken care of, the District Engineer assured, as more detailed plans were made for modernization of the lower section of the waterway. Since construction at these sites was many years in the future detailed studies done now would have to be reaccomplished at some later date, he explained. Further coordination between the District and State officials did not reconcile the State.

In writing to Dr. Eisel on 12 May 1975, Chicago District Engineer, Colonel James H. Miller, explained that without State assurances of cooperation, planning on the project would cease. "Your letter," he wrote, "leaves me in the uncomfortable position of having pursued a plan closely meeting the state's desires, yet having no basis for recommending initiation of subsequent . . . planning efforts. It would be irresponsible for me," he concluded, "to recommend the continued expenditure of public funds in developing this project without an assurance that the State of Illinois fully supports the plan recommended." The assurances never came. Work on the duplicate lock study was deferred and is awaiting new interest in the project by the State.

In retrospect, suspension of work on both the Springer Lake and Duplicate Locks projects in 1975 can be viewed as a watershed marking a change in the kind of Chicago District projects receiving broad public support. The demand for public participation in the planning process continued, as did intense public scrutiny of environmental impacts. But increasingly after 1975 the public seemed to seek smaller-scale solutions to water resource problems, whether these problems were confined to a relatively short stretch of river or extended over an entire metropolitan area.

Indicative of the new trend were two small Chicago District flood control projects that were well received by the public. One project consisted of a cleanup of a 12-mile stretch of the North Branch, Chicago River; the other, a similar cleanup of the same length of channel on the Little Calumet River in Illinois. Both projects, authorized in 1970 and 1974, respectively, involved removing fallen trees, roots, and manmade debris that contributed to the flooding, unsightliness, and pollution of the two streams.

Efforts to revive the polluted and debris-laden North Branch, Chicago River, began in the 1960s with a citizen's effort that led to Federal legislation passed in 1970 authorizing a river cleanup project. After the initial cleanup, completed in 1973 with the local sponsorship of the Metropolitan Sanitary District of Greater Chicago (MSDGC), the need to maintain the channel became apparent. In March 1974 legislation was amended to authorize the Corps "to clear the channel, and not to exceed \$150,000 each fiscal year thereafter to maintain such a channel." Added, too, was the provision that a non Federal interest, which in future cleanups continued to be the MSDGC, "shall pay 25 percentum of the cost of maintaining the channel free of trees, roots, debris, and objects." (River and Harbor Act of 1974.)

During the second cleanup in 1978, the river began to show signs of recovery after decades of neglect. When the contractor performed the first cleanup in 1973 he reported finding solid muck along the river bottom. By the end of the 1978 cleanup, the same contractor was able to confirm that the revived current had uncovered sand and gravel at various places in the channel.

The Little Calumet River cleanup began early in 1975 when the Chicago District arranged for the Army National Guard to remove debris that had accumulated at bridge abutments along the river. Beginning the cleanup in late August, the Guard continued removing debris on weekends, working into late October. Efforts of the



A river cleanup crew clears tree branches and other debris from a stretch of the North Branch, Chicago River, during 1978.

state unit significantly reduced the overall cost of the cleanup and received wide public acclaim.

The District's contracted work on the Little Calumet cleanup began in June 1976. By the time the contractor completed work that September, he had removed objects ranging from car bodies to grocery carts, from aerial practice bombs to the proverbial kitchen sink.

The public's search for simpler, less costly, yet environmentally sound solutions to water resource problems also extended to the complex issue of urban flood damage protection within the Chicago metropolitan area.

In Cook County, Illinois, one combined sewage system is used to carry both sanitary sewage and stormwater runoff from Chicago and its 52 adjacent communities. During dry weather, the system and treatment plants can effectively handle sanitary sewage. But during wet weather they can accommodate only a small portion of the storm runoff. When the storm runoff exceeds the system's capacity, a mixture of raw sewage and polluted storm runoff backs up from the sewers, flooding streets, viaducts, and basements. Untreated, the polluted mixture is discharged from the sewer system into local streams, eventually flowing into the Illinois Waterway.

The problems resulting from the combined sewer system were addressed in studies conducted by the State of Illinois and local

interests during the 1960s. The Tunnel and Reservoir Plan (TARP) adopted by the MSDGC evolved from these studies.

As envisioned by the MSDGC, the Tunnel and Reservoir Plan consists of a system of tunnels and retention reservoirs to carry and store sewage and stormwater runoff until they can be processed in a sewage treatment plant. The plan, designed to offer a solution to water quality and flooding problems was divided into two phases: Phase 1 for water quality improvement and Phase 2 for flood control.

The water-quality portion of TARP, Phase 1, is now under construction by the MSDGC, funded in part by the United States Environmental Protection Agency. When completed, this phase will consist of 110 miles of tunnels, a near-surface water collector, and drop-shaft systems that will hold the heavily polluted "first flush" of stormwater runoff and carry it to sewage treatment plants for processing.

Implementation of the flood-control portion of TARP—Phase 2—would include construction of about 22 miles of tunnels, a near-surface water collector, drop-shaft systems, and reservoirs. The reservoirs would hold stormwater runoff following the "first flush" until sewage treatment plants could accommodate and process it.

Growing public concern over the high cost of TARP and other issues has led many to question the advisability of proceeding with construction of TARP, Phase 2. To determine if there is a less costly, socially and environmentally acceptable alternative to the flood-control problem of TARP, Congress directed the Corps of Engineers to conduct a Phase 1 General Design Memorandum Study of the problem. Authorized by the Water Resources Development Act of 1976, the Chicago District began the study in 1979.

The Chicago District is conducting its study in three stages. The first, completed in 1979, involved preparing a plan of study. The second, begun in 1980 and continuing into 1982, deals with the formulation of alternative flood-control plans. The third stage will conclude at the end of 1983 with submission to Congress of a recommended plan or combination of plans for urban flood damage reduction within the combined sewer area.

Increasingly after 1975, the Chicago District found some of its activities under the intense scrutiny of conflicting publics. Typical of this trend was the Increased Lake Michigan Water Diversion Demonstration and Study Program.

In the 1976 Water Resources Development Act, Congress directed the Corps to conduct a study and demonstration of the feasibility of increasing the average annual diversion from Lake Michigan from

the present limit of 3,200 cubic feet per second (cfs) to 10,000 cfs to alleviate Great Lakes shoreline erosion and to improve the water quality of the Illinois Waterway.

Diversion of Lake Michigan water began in a small way in the mid-1800s. Before 1848, when the Illinois and Michigan Canal was completed, the Chicago River emptied into Lake Michigan. Completion of the I&M Canal allowed reversal of the Chicago River flow and diversion of water from Lake Michigan to the Mississippi River.

Prior to 1900 diversion averaged less than 1,000 cfs a year. However, upon completion of the Sanitary and Ship Canal, diversions progressively increased to a maximum of about 10,000 cfs in 1928. In 1922, the State of Wisconsin successfully sought an injunction to bar the State of Illinois from diverting Lake Michigan water. That injunction was overturned in 1925 by the United States Supreme Court, and diversion was allowed at an average rate of 8,500 cfs.

Additional decrees were issued by the United States Supreme Court in 1930 and 1967. The 1930 decree required the State of Illinois and the Metropolitan Sanitary District of Greater Chicago to reduce diversion of water from Lake Michigan to an average of approximately 3,100 cfs. The 1967 decree limited the diversion, including domestic pumpage, to an average of 3,200 cfs over a five-year period.

The congressionally authorized study of increased diversion has strong advocates and opponents. Those owning land bordering the Great Lakes tend to support the program because they believe it offers some hope of alleviating the lake shore erosion and property damage caused by high lake levels. Opposed to the project, in general, are those living along the Illinois Waterway. They fear a greater diversion would increase the possibility of flooding.

The Chicago District's final study report will be completed in 1981. Because funding levels have prevented implementation of the diversion demonstration, the study's findings on the increased diversion will be based on extensive computer analysis and environmental studies.

While public opinion was split on many Corps' efforts in the 1970s, emergency and disaster assistance activities and the National Dam Inspection Program received a warmer acceptance.

The success of both of these programs has been attributed to the readiness of Corps districts to respond to emergency situations. During the near-record Illinois River flooding in 1979, for example, Chicago District floodfighting teams were mobilized within hours to protect flood control structures threatened by the rising river. The

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concern and
reevaluation:
1966–1980

teams assisted local residents by providing sandbags and by inspecting endangered flood control structures and recommending remedial measures.

In implementing the Illinois phase of the National Dam Inspection Program the Chicago District again exhibited a readiness to respond to an immediate need. In December 1977 the Chicago District was charged with inspecting those non-Federal dams in Illinois whose failure would endanger life and property. The Illinois inspections were assigned after President Carter directed the Secretary of the Army to begin a nationwide program to inspect high-hazard-potential dams. Within twelve days of the President's order (issued December 2, 1977), the Chicago District had begun the inspections.

Although a national dam inspection program had been authorized by Congress in 1972, funding had been sufficient only to compile an inventory of dams. As part of that effort, the Chicago District catalogued 936 Illinois dams in 1975. When full implementation of the program began in 1977, the District was assigned the task of updating its dam inventory and inspecting dams classified as having high hazard potential because of their location upstream of populated areas that would be seriously affected if the dams failed.

During the first two years of the program, fiscal years 1978 and 1979, 109 dams in the high-hazard-potential category were inspected. As this history nears publication, an additional 65 dams are scheduled for inspection before the end of fiscal year 1980.

The District will transfer the Illinois dam inspection program to the State of Illinois at the end of 1981.

During an inspection, a Chicago District engineer discovers water seeping through the spillway of a privately owned Illinois dam.



Like the emergency assistance program, other Chicago District activities continued relatively unchanged during the late 1970s. Maintenance of the Illinois Waterway locks, for example, remained a major part of the District's operating budget from 1975 to 1979. Suspension of the Duplicate Locks Project in 1975 emphasized the importance of maintaining the existing Waterway project in peak condition. Toward that end, the Chicago District ordered a 60-day shutdown on the main stem of the Waterway in 1978 to allow for major rehabilitation of the Dresden Island, Marseilles, and Starved Rock locks. Costing in excess of \$10 million, the repair work included resurfacing the lock walls of the Dresden Island and Starved Rock locks, electrical cable and switchboard replacement at the Marseilles Lock, and repair of the mechanical gate operating equipment at all three.

In the 1970s the Corps of Engineers found the general public and local governments increasingly reluctant to support large-scale projects such as Duplicate Locks. Toward the end of the decade this reluctance began to be reflected in a declining construction workload for the Chicago and several other Corps districts.

Faced with a decreasing domestic workload in some districts and increasing commitments overseas, the Chief of Engineers, Lieutenant General John W. Morris, ordered initiation of a major Corps reorganization study in December 1978. The aims of that study, according to the North Central Division Engineer, Major General Richard Harris, were "to study a number of options relative to distribution of our workforce, responsibilities, and human resources in order to better respond to current and future needs. . . ."



Closed to commercial traffic, Dresden Island Lock undergoes gate repairs. The Chicago District closed the lock, along with the Marseilles and Starved Rock locks, during August and September 1978 to conduct major rehabilitation work.

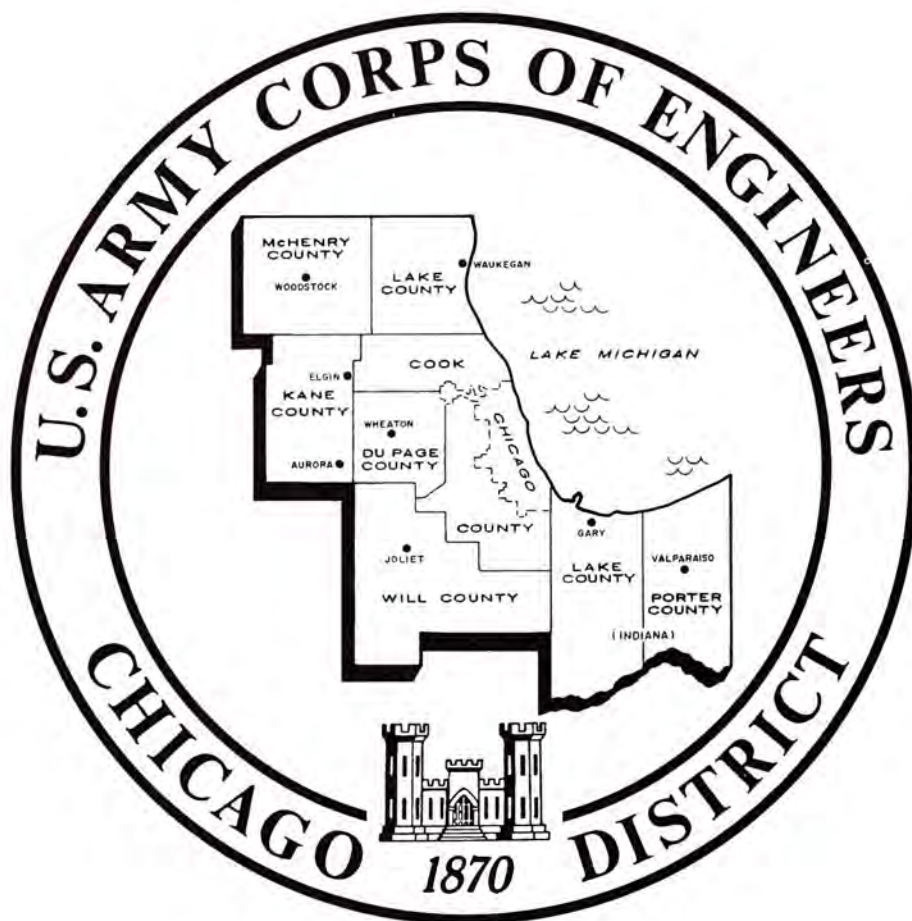
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Among the proposals considered in the reorganization study was closure of the Chicago District office. Other district offices considered for closure were those at Buffalo, Charleston, and San Francisco.

Following the 10-month-long reorganization study, the Chief of Engineers announced in November 1979 that the Chicago District office would not be closed but that its boundaries would be realigned to include only the eight-county Chicago metropolitan area made up of six counties in Illinois and two in Indiana. Chicago District activities in Illinois outside the metropolitan area would be transferred to the Rock Island District; activities in Wisconsin and those in Indiana outside Lake and Porter counties would be transferred to the Detroit District.

Realignment of the District boundaries, and the transfer of activities, began early in 1980 and continue as this history is published.

New Chicago District
boundaries, as established
by the 1979
reorganization studies.



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Notes

Part One

Chapter One

1. The complete text of Major Long's report of 4 March 1817 to Acting Secretary of War, George Graham, was published in "The National Register," No. 13, vol. III, vol. I (29 March 1817).

2. Father Dablon's comment on the Chicago portage may be found in *The Jesuit Relations and Allied Documents, Travels and Explorations of the Jesuit Missionaries in New France 1610-1791*, vol. LVIII, page 105, edited by Reuben Goldthwaites, the Burrows Brothers Company (Cleveland, 1899).

3. For a discussion of the Chicago portage see Quaife, Milton Milo, *Chicago and the Old Northwest 1673-1835*, University of Chicago Press. For information on the Chicago portage and the Fox-Wisconsin Rivers' portage see Hulbert, Archer Butler, *Portage Paths, The Keys of the Continent* (Cleveland, 1903).

4. Nathaniel Pope's appeal to include Chicago in the State of Illinois' boundaries appears in *The Debates and Proceedings in Congress of the United States* published by Gales and Seaton, Washington, 1854. See Fifteenth Congress, First Session, Column 1677 (April, 1818).

5. Seldom has an expedition been so well documented as Governor Cass' expedition to the Old Northwest in 1820. Schoolcraft's original narrative appeared in May 1821 with the cumbersome title, *Narrative Journal of Travels Through the Northwestern Region of the United States, Extending from Detroit Through the Great Chain of American Lakes to the Sources of the Mississippi River, Performed as a Member of the Expedition Under Governor Cass, in the Year 1820*. It was published by E. and E. Horsford of Albany, New York. In 1953 the Michigan State College Press, East Lansing, Michigan, republished *The Narrative* as edited by Mentor L. Williams. In this edition Mr. Williams has also printed many of the journals of other participants in the expedition and related papers.

6. Professor Keating's account, the *Narrative of an Expedition to the Source of St. Peter's River, etc., Performed in the Year 1823*, was first published in Philadelphia in 1824. It was republished in 1959 by Ross and Haines, Inc., Minneapolis, Minnesota.

Chapter Two

1. For a history of the nonmilitary activities and organization of the United States Army Engineers see Holt, Stull W., *The Office of the Chief of Engineers of the Army*, Johns Hopkins Press (Baltimore, 1923). Brief and useful is *A History of the U. S. Topographical Engineers, 1813-1863*, in the June and July 1942 issues of "The Military Engineer." University Microfilms Inc., Ann Arbor, Michigan

has published the 1968 thesis of David Garry Ryan, *War Department Topographical Bureau, 1831-1863, An Administrative History*, an invaluable aid to understanding how the Bureau functioned.

2. Letters sent by the Topographical Bureau from 1829-1870 are available on Microcopy 66 made from the originals in Record Group 77 in the National Archives, Washington, D. C.

3. Registers of letters received, Microcopy 505, and letters received, Microcopy 506, by the Topographical Bureau (1824-1865) are available from the National Archives. Belin's 1832 report on the survey for the Illinois River-Lake Michigan canal may be found in Roll 4, of Microcopy 506, letters received by the Topographical Bureau of the War Department (1824-1865).

Annual reports of the Engineer Department and the Topographical Bureau for the 1820's and 1830's are found in *American State Papers Legislative and Executive of the Congress of the United States*, published by Gales and Seaton, Washington.

Chapter Three

1. This chapter is based on the correspondence of the Office of Public Works at Chicago (March 1833-May 1843), one volume, Item 330, Record Group 77, in the National Archives.

Chapter Four

1. Captain Cram's annual report for 1839 is found in *Senate Document 58*, 26th Congress, 1st Session.

2. Captain Cram's reports on the construction of roads in Wisconsin Territory are contained in Roll 13, Microcopy 506, letters received by the Topographical Bureau of the War Department (1824-1865). Fred C. Holmes, *Wisconsin*, Volume I, p. 282-284, provides an example of how little is understood concerning the Federal road building effort in Wisconsin during this period.

3. *Ibid.*, 225, describes Captain Cram's survey activities on the Wisconsin-Michigan border.

4. Captain Cram's report of his beginning of a hydrographic survey of Lake Michigan in 1841 is contained in *Senate Document #256*, 27th Congress, 2nd Session.

5. The records of the Court of Inquiry and the trial of Captain Cram are found in the records of the Office of the Judge Advocate General (Army), Record Group 153, Items DD133 and DD134.

6. The 1843 Board of Engineers' report concerning the location of the harbor at Milwaukee is found in Roll 38, Microcopy 506, letters received by the Topographical Bureau of the War Department (1824-1865).

Chapter Five

1. Captain McClellan's letters and reports to the Topographical Bureau are found in National Archives Microfilm Publication, Microcopy No. 506, Roll 47 (December 1824-December 1850).

2. The results of the 1842 survey of commerce on the Great Lakes by the Topographical Bureau were printed in Executive Document #2, 28th Congress, 1st Session.

For development of Lake Commerce in the early 1840's see also James L. Barton, *Letter to the Hon. Robert McClelland, Chairman of the Committee on Commerce, U.S. House of Representatives ... in Relation to the Value and Importance of the Commerce on the Great Western Lakes*, Jewett, Thomas and Company (Buffalo, 1846).

Commerce on The Western Lakes and Rivers is the subject of a special report by Colonel Abert to the Secretary of War printed in *Executive Document #4*, 30th Congress, 1st Session.

3. For Thurlow Weed's report and other documents see *Chicago River-and-Harbor Convention, an Account of Its Origins and Proceedings*, compiled by Robert Fergus, Fergus Historical Series, No. 18 (Chicago, 1882).

4. Captain Joseph Dana Webster's correspondence with the Topographical Bureau is found in National Archives Microfilm Publication, Microcopy 506, Rolls 75, 76, and 77.

Chapter Six

1. Colonel Graham's correspondence with the Topographical Bureau including his annual reports is available in National Archives Microfilm publication, Microcopy 506, Rolls 23 through 31.

2. Colonel Cram's correspondence with the Topographical Bureau as well as his annual reports for the period covered in Chapter 6 are found in Roll 17 of the above-cited National Archives Microcopy.

Part Two

Chapter One

1. George W. Cullum's *Biographical Register of the Officers and Graduates of the U. S. Military Academy at West Point, New York* is the source for most of the biographical information throughout. In some instances information in the Cullum volumes has been supplemented with material from the archives of the Military Academy.

2. *The Annual Report of the Chief of Engineers* for 1867. The Chief of Engineers' Annual Reports have been used extensively, not only for this chapter, but for all of Part Two. An index to these reports for the 1866-1912 period has been published as *House of Representatives Document #740*, 63rd Congress, 2nd Session. Subsequently, this index was brought down to 1918 and the new material published in *House of Representatives Document #724*, 66th Congress, 2nd Session. Henceforth, references to these reports will be given in the form, *Annual Report (1867)*.

3. *Annual Report (1866)*, 455.

4. *Annual Report (1870)*, 106.

5. *Annual Report (1876)*, 437.

6. *Ibid.*, 428.

7. *Ibid.*, 429.

8. *Ibid.*

9. For the background origin and subsequent history of the "Refuse Act," a section of the rivers and harbors act of 1899, see Albert E. Cowdrey, "Pioneering Environmental Law: The Army Corps of Engineers and the Refuse Act," in the *Pacific Historical Review*, Volume XLVI, Number 3, August, 1975.

10. *Annual Report (1891)*, 330.

11. *Annual Report (1892)*, 2799.

12. *Annual Report (1895)*, 2696.

13. Cowdrey, 346.

14. *Annual Report (1901)*, 2989.

15. *Annual Report (1910)*, 2151.

16. *House of Representatives Document #237*, 63rd Congress, 1st Session.
17. In 1935 the Great Lakes Division, then located at Cleveland, Ohio, directed District Engineers to prepare histories of the harbor projects under their jurisdiction. As a result, during the next four years histories were prepared for most of the Great Lakes harbors which, according to a pattern provided by the Division, contained sections on the founding and growth of the community, a summary of reports on the harbor, a summary of Federal improvements, improvements by local interests, governmental costs and commercial statistics. Except for information on local communities, these chronologies are based on Annual Reports. Copies of the histories are on file at the Chicago District.
18. *Annual Report (1870)*, 105.
19. *Annual Report (1873)*, 247.
20. *House of Representatives Document #342*, 56th Congress, 1st Session.
21. *Senate Miscellaneous Document #36*, 40th Congress, 3rd Session.
22. *Annual Report (1897)*, 2900.

Chapter Two

1. *House of Representatives Document #43*, 46th Congress, 3rd Session.
2. *House of Representatives Miscellaneous Document #63*, 40th Congress, 2nd Session.
3. *House of Representatives Miscellaneous Document #65*, 41st Congress, 2nd Session.
4. *House of Representatives Executive Document #1*, 43rd Congress, 1st Session, 258.
5. *Annual Report (1899)*, 2757, 2763, 2771, and 2777.
6. *House of Representatives Document #62*, 59th Congress, 1st Session.
7. General Douglas MacArthur in "Report of the Chief of Staff," 1932.

Chapter Three

1. Memorials from the state legislature in favor of connecting the waters of the Mississippi River with those of Lake Michigan include five from Wisconsin printed in *House of Representatives Miscellaneous Document #82*, 40th Congress, 2nd Session (1868); *House of Representatives Miscellaneous Document #35*, 40th Congress, 3rd Session (1869); *Senate Miscellaneous Document #62*, 41st Congress, 2nd Session (1870); *House of Representatives Miscellaneous Document #8*, 42nd Congress, 1st Session (1871) and *House of Representatives Miscellaneous Document #78*, 42nd Congress, 2nd Session (1872).

Resolutions in favor of Fox-Wisconsin River improvement from the Minnesota State Legislature were printed in *House of Representatives Miscellaneous Document #115*, 41st Congress, 2nd Session (1870), from the Legislature of Iowa in *House of Representatives Miscellaneous Document #123*, 41st Congress, 2nd Session (1870) and *Senate Miscellaneous Document #44*, 44th Congress, 1st Session (1876) and from the Legislature of Nebraska in *Senate Miscellaneous Document #55*, 42nd Congress, 2nd Session (1872).

2. Conventions called to promote Federal construction of a waterway between the Mississippi River and Lake Michigan are documented in "Report of the Northwestern Ship Canal Convention (May 1864) *House of Representatives Miscellaneous Document #23*, 38th Congress, 2nd Session and "Resolutions of the Convention held in Prairie Du Chien, Wisconsin" (November 1868), *Senate Miscellaneous Document #37*, 40th Congress, 3rd Session.

3. *Senate Miscellaneous Document #16*, 39th Congress, 2nd Session.

4. *Annual Report (1876)*, 207. Major Warren's 109-page 1876 report is an invaluable document for anyone interested in the early history of the Fox-Wisconsin waterway and its condition at the time it was taken over by the Federal Government.

5. For an account of the social and political forces in the middle west which led to demands for improvement of the Fox-Wisconsin waterway see Solon J. Buck, *The Granger Movement* (Harvard University Press, Cambridge, 1913).

6. *Senate Report #307*, Part 2, 43rd Congress, 1st Session.

7. *Annual Report (1887)*, 270.

8. *Annual Report (1894)*, 329.

9. *Annual Report (1887)*, 2034.

Chapter Four

1. *Annual Report (1879)*, 1577.

2. *Annual Report (1877)*, 2146.

3. *Annual Report (1890)*, 2429.

4. *Ibid.*, 3437.

5. *Illinois Waterway Report* (Springfield: Internal Improvement Commission of Illinois, 1909), 15.

6. *Annual Report (1893)*, 2811.

7. *Annual Report (1894)*, 2152.

8. *Annual Report (1896)*, 2598.

9. The Illinois-Mississippi Canal is considered in detail in Chapter 5 of Roald Tweet's *A History of the Rock Island District, Corps of Engineers 1866-1975*, June 1975.

10. *Annual Report (1893)*, 2794 *et seq.*

11. *Ibid.*

12. *Annual Report (1898)*, 2422.

13. *Annual Report (1893)*, 2815.

14. *Annual Report (1899)*, 2839.

15. *Ibid.*, 40 *et seq.* The contentions and positions of the Sanitary District of Chicago are presented in "The Diversion of the Waters of the Great Lakes by Way of the Sanitary and Ship Canal of Chicago," by Lyman E. Cooley (Chicago, 1913).

16. *House of Representatives Document #237*, 63rd Congress, 1st Session (1913), 19.

Part Three

Chapter One

1. Report . . . by the District Engineer, First Chicago District (Chicago, Illinois, 10 May 1930), 5.

2. Unpublished manuscript, "Activities of the Corps of Engineers, United States Army, in the State of Illinois" (11 April 1935), 16.

3. *Ibid.*, 17.

4. *House of Representatives Document #184*, 73rd Congress, 2nd Session.

5. *House of Representatives Document #180*, 73rd Congress, 2nd Session, 35.
6. *Ibid.*, 5-6.
7. *Ibid.*, 3.
8. *House of Representatives Document #677*, 79th Congress, 2nd Session.

Chapter Two

1. Lawrence A. Pomeroy, Jr., "The Bulk Freight Vessel," *Inland Seas*, Volume 1 (1945), 191 *et seq.*
2. "History of Calumet Harbor and River, Illinois and Indiana," United States Engineer Office, Chicago (20 May 1958).
3. *House of Representatives Document #233*, 76th Congress, 1st Session.
4. *House of Representatives Document #19*, 74th Congress, 1st Session.
5. *House of Representatives Document #47*, 74th Congress, 1st Session.
6. *House of Representatives Document #41*, 74th Congress, 1st Session, 20.
7. *Digest of Water Resources Policies*, Office of the Chief of Engineers (1975), A100.
8. *House of Representatives Document #34*, 74th Congress, 1st Session.
9. *House of Representatives Document #1067*, 61st Congress, 3rd Session.
10. *House of Representatives Document #80*, 74th Congress, 2nd Session.
11. *House of Representatives Document #255*, 75th Congress, 1st Session.
12. Pomeroy, 197.
13. *House of Representatives Document #302*, 79th Congress, 1st Session, 3.
14. Letter: J. O. Colonna, Colonel Corps of Engineers, District Engineer, Milwaukee District, to Green Bay Association of Commerce (24 March 1949).
15. *House of Representatives Document #134*, 87th Congress, 1st Session, vii.
16. *Ibid.*, 56.

Chapter Three

1. *House of Representatives Document #263*, 58th Congress, 1st Session.
2. *House of Representatives Document #182*, 72nd Congress, 1st Session.
3. *Ibid.*
4. *House of Representatives Document #604*, 75th Congress, 3rd Session.

Chapter Four

1. Lenore Fine and Jesse A. Remington, *The Corps of Engineers Construction in the United States*, Office of the Chief of Military History, United States Army, Washington, D. C. (1972), 244.
2. *Ibid.*, 440.
3. *Ibid.*, 459.
4. *Ibid.*, 441.
5. *Ibid.*, 466.
6. *GLD in World War II* (9 March 1946).
7. Blanche D. Coll, Jean E. Keith, and Herbert H. Rosenthal, *The Corps of Engineers: Troops and Equipment*, Office of Military History, Department of the Army, Washington, D. C. (1958).
8. "Chicago Bulk Mail Center Forest Park, Illinois," Fact Sheet (30 June 1977).

1. Feasibility Study, Chicago District (September 1966).
2. "Newsletter," General Dodge to General Cassidy (12 July 1965).
3. Ibid. (4 September 1966).
4. Feasibility Study (September 1966).
5. "Informal Quarterly Report," General Dodge to General Cassidy (27 February 1967) and "Historical Supplement" (1967), Chicago District.
6. "Historical Supplement" (1968), Chicago District.
7. "Report of the United States Army Corps of Engineers to the Four-State Enforcement Conference on Lake Michigan Pollution," Brigadier General Robert M. Tarbox (25 February 1969).
8. Ibid.
9. "Quarterly Report," General Tarbox to General Cassidy (16 June 1969).
10. Letter, General Clarke to General Watkins (24 March 1970).
11. Ibid. (18 June 1970).
12. Informal Historical Summary (1870), Chicago District.
13. Letter, General Clarke to General Graves (24 June 1971).
14. Letter, General Graves to General Clarke (8 December 1971).
15. Letter, General Bachus to General Gribble (30 July 1974).
16. "Quarterly Report," Colonel Miller to General Moore (10 October 1975).
17. "Quarterly Report," Colonel Farrar to General Moore (6 May 1976).
18. "Quarterly Report," Colonel Remson to General Moore (10 August 1976).
19. Narrative for Presentation by Colonel Andrew C. Remson to Major General John W. Morris (5 August 1976).
20. Narrative for Colonel Remson's briefing of Inspector General Team (8 November 1976).
21. For a discussion of this entire question, see John F. Ferrell, "From Single to Multi-Purpose Planning: The Role of the Army Engineers in River Development Policy, 1824-1930." Published in draft form by Historical Division OCE, Baltimore, Maryland (February 1976).
22. *Digest of Water Resources Policies*, A-139-A-146.
23. Ibid., A-133-A-138.
24. "Quarterly Report," General Tarbox to General Cassidy (23 February 1968).
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26. Letter, Colonel Miller to General Bachus (8 July 1974).
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36 years service
Retired 1962
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